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DEWEY (D. H.) & BARGER (W. R.). **The occurrence of bacterial soft rot on Potatoes resulting from washing in deep vats.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 325–330, 1 fig., 1948.

The dumping of new potatoes directly from trucks into deep water vats has been used in Kern County, California, for several years to facilitate handling in packing. In 1946 serious transport losses were experienced due to tuber breakdown, probably caused by bacterial soft rot (*Erwinia carotovora*) [*R.A.M.*, 28, p. 306].

The results of preliminary laboratory tests with White Rose tubers following their submersion in contaminated water demonstrated that hydrostatic pressure had a definite influence on soft rot development, the mean infection varying from 2·2 to 23·3 per cent. in uninjured tubers as pressure varied from 0 to 5 lbs, and from 0·4 to 9·5 per cent. in mechanically injured lots. The greatest amount of infection (41·4 to 48 per cent.) occurred in sun-injured tubers [ibid., 26, p. 124]. Mechanical injury did not increase the incidence of the disease.

The effect of submerging potatoes in contaminated water for various periods at different depths upon the subsequent incidence of soft rot was studied in a field test. The tubers submerged for one hour at 1 or 5 ft. had 8·4 per cent. mean infection, one hour at 10 ft. 16·5 per cent., ½ hour at 10 ft. 10·4 per cent., while the controls, washed in ordinary water, had only 4·3 per cent.

These data indicate that it is not advisable to use vats for bulk handling at the shipping point, as this method tends to increase the incidence of *E. carotovora*. It is evident that tubers not quickly removed from the soaking vat are most likely to rot and become a source of infection during the transit and marketing period. To prevent this it is recommended to submerge small quantities at a time, cleaning up between lots.

LUTMAN (B. F.) & WHEELER (H. E.). **Bacillus megaterium de Bary from the interior of healthy Potato tubers.**—*J. Wash. Acad. Sci.*, 38, 10, pp. 336–340, 12 figs., 1948.

In attempting to grow (over a period of several years) micro-organisms from the filamentous plant intercellular inclusions described by Lutman [*R.A.M.*, 25, p. 356], the authors' method was to break open mature, sprouting Burbank Russet potato tubers, disinfected for two hours in 0·5 per cent. formaldehyde, and cut disks of tissue from the broken surfaces. After washing in sterile water, the disks were ground to a fine paste, which was transferred to sterile water, and then plated out on nutrient agar plus 2 per cent. dextrose and 1 per cent. yeast extract. The broken tubers were put between layers of sterile filter paper in a glass dish for five or six days. Meantime, the walls of the new cork cambium which developed at the broken surface became filled with filamentous strands, indicating that the micro-organism had renewed its activity after being dormant in the tuber. The broken surfaces were washed in 95 per cent. alcohol and the adhering alcohol was burned

off. Tissue disks were again removed, ground to a paste, and diluted to 1 in 10,000 before plating.

The predominant organism obtained was identified as *Bacillus megaterium* [ibid., 16, p. 676], which lives as branching threads in the plants and in culture media breaks up into short motile rods. It is thus intermediate between bacteria and actinomycetes.

The same technique was used with small Bliss Triumph tubers fresh from the soil and larger tubers of the same variety grown in Florida. Again the same organism was isolated. It was also common in potato roots, sweet potatoes, and carrots.

It is concluded that the denser material between plant cell walls consists of living micro-organisms which may be grown in culture outside the plant. The old conception that the interior of plants is sterile is no longer tenable.

In an addendum by N. R. Smith to this paper reference is made to Sanford's work [ibid., 27, p. 293] on bacteria in normal potato plants and legumes, and to that on similar lines by Tervet and Hollis [ibid., 28, p. 273].

Schaal (L. A.) & Fults (J.). **Some preliminary studies on the antagonism of soil fungi and bacteria to Actinomyces scabies.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, p. 39, 1948.

Twenty physiologic races of *Actinomyces scabies* [*R.A.M.*, 26, p. 508] exhibited varying degrees of antagonism to bacteria and fungi isolated on agar plates from four different soils, three of which had produced scabby potato crops and one yielded healthy tubers. Most races of the pathogen were antagonistic to the bacteria tested. Certain species of *Aspergillus*, *Fusarium*, and *Trichoderma* readily overran the colonies of *Actinomyces scabies*.

Steinbauer (C. E.). **A Sweetpotato from Tinian Island highly resistant to Fusarium wilt.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 304–306, 1948.

Of three sweet potato selections collected on Tinian Island in the Marianas [Pacific Ocean], one designated P.I. 153655 was found to possess a high degree of resistance to *Fusarium* wilt (*F. batatatis* [*F. bulbigenum* var. *batatas*] and *F. hyperoxysporum* [*F. oxysporum* f.2]) [*R.A.M.*, 27, p. 466].

During the winters of 1946–7 and 1947–8 its resistance was tested in replicated greenhouse trials, and in the summer of 1947 in replicated field tests. Pruned vine cuttings rooted in sand were dipped in a spore suspension of three to five virulent wilt strains and planted in the greenhouse at 70° to 85° F. The extent of wilt injury in surviving plants was ascertained after four weeks, using the following scoring method, 0 (no infection) to 4 (dead) for 25-plant lots. The mean number of infections for four tests was 19·3, for Pelican Processor (L-5) and B-196 (both resistant) 67·8 and 57·3, Triumph (tolerant) 87·7, and Unit I Porto Rico and Nancy Hall (very susceptible) 99·4 and 98·5, respectively.

The results of field tests showed that P.I. 153655 yielded an average of 275 bush. per acre, as compared with 255, 402, and 159 for Pelican Processor, B-196, and Triumph, respectively.

Laudelout (H.), D'Hoore (J. L.), & Fripiat (J. J.). **Influence des microorganismes sur certaines propriétés physico-chimiques des sols de Yangambi.** [The influence of micro-organisms on certain physico-chemical properties of the soils of Yangambi.]—*Bull. agric. Congo belge*, 40, 1, pp. 339–354, 5 graphs, 1949.

In the course of a study of the influence of micro-organisms on certain physico-chemical properties of a yellow sandy soil under primitive forest near Yangambi, Belgian Congo, the authors found that at a depth of 0 to 10 cm., when the logarithm of the total number of organisms present was 6·287, the relative abundance of bacteria, actinomycetes, and fungi was, respectively, 35·7, 63, and 1·3 per cent.

At lower depths to 120 cm. the logarithm gradually decreased, the numbers of fungi varying between nil and 0·6 per cent. and of actinomycetes between 34·2 and 74·5 per cent.

In the upper layers of the soil, where they were most numerous, the Actinomycetes were present as vegetative mycelium, whereas in the deeper layers they occurred mostly as chains of spores.

Of the relatively few fungi, *Verticillium terrestre* and *Trichoderma glaucum* were the predominant species. A bibliography of 36 titles is appended.

Slooff (Miss W. C.). **Over de oorzaak en de bestrijding van inwendige schimmel in de Muskaatnoot.** [On the cause and control of internal mouldiness in Nutmeg.] —*Landbouw*, 21, 1–2, pp. 43–60, 1 diag., 1 graph, 1949. [English summary.]

Ever since the enactment in 1935 of more stringent legislation against the fungal contamination of foodstuffs and drugs in the United States, fixing the maximum incidence of mouldiness in nutmeg at 10 per cent., the Indonesian export trade has experienced great difficulties in reaching the requisite standard. To assist the small growers of Amboina and other islands in overcoming this defect, trials have been carried out at Macassar [Celebes] on different methods of harvesting, drying, and storage.

Freshly picked ripe nutmegs invariably showed a much lower percentage of mouldiness than did those collected at irregular intervals under the trees. No contamination developed either in ripe, hand-picked nuts soaked in tap water for two hours before curing for ten days at a moderate temperature (35° to 40° C.), or in the unwetted controls, indicating that rainy weather during the harvest is without influence on the incidence of mouldiness. Curing for the whole time at the above-mentioned temperature gave better results than holding the nuts at 50° to 60° during the first two days and then at 35° to 45°. The former method has been practised for centuries in the Banda Islands, where the process covers a period of six weeks. On the island of Siau the fresh nuts are cured on a bamboo rack for two days at a moderate temperature or covered with gunny bags before spreading them out along the wayside in the sun. Curing must be started at moderate temperatures to prevent the cracking of shells and seeds during the course of shrinking. Cracked nuts are unfit for consumption and tend to be mouldy; thus, in a high temperature curing trial they showed 10 to 28 per cent. infection compared with none in the uncracked lot. The fissures may be almost imperceptible, and the unintentional inclusion of mouldy nuts may spoil a consignment.

A comparative investigation of mouldiness in freshly cured nuts and samples stored for three months at a shipping centre showed that maintenance in a moist climate raised the percentage of mouldiness considerably. From the soundness of the nutmegs kept for long periods in the Banda curing-houses at 35° to 40° it was concluded that mould development may be prevented by storage in a drier atmosphere. In a series of storage tests it was found that the incidence of mouldiness rose from 1 to 67 per cent. in three months in samples kept in an atmosphere of 85 per cent. relative humidity. Since this degree of moisture is very apt to prevail in the nutmeg-producing islands, exporters are advised either to despatch the consignments to a drier climate as soon as possible after curing or to erect storehouses where the atmospheric humidity can be reduced by raising the temperature by some 10°.

The problem of mouldiness in nutmegs had already been studied by H. R. A. Muller in 1935 (*Arch.* [? *Meded.*] *Inst. PlZiekt., Batavia*, 1936), and his conclusions were reproduced in a compilation by J. Reitsma (ibid., 1947) of references to the disease in the archives of the Phytopathological Institute. They may be summarized as follows. Burst nuts or those damaged by beetle feeding are always heavily contaminated by a great variety of moulds, whereas *Aspergillus* spp. are almost exclusively responsible for the infection of sound ones. External mouldiness

does not necessarily imply a corresponding condition in the interior, but the percentage of internal infection does tend to be higher in such cases than in unblemished nuts. Wrinkled nuts and those collected under the trees are mostly severely infected. The curing process should be rapid for the first two days, during which the initial weight should fall by 22·5 per cent., and then continue slowly until the total loss of weight ranges from 30 to 32·5 per cent. The entire curing process should not last longer than eight to ten days.

TIDBURY (G. E.). **The Clove tree.**—xi+212 pp., 17 pl., 1 fig., 2 diags., 1 map, London, Crosby Lockwood and Son, Ltd., 1949. 18*s*.

Included in this interesting study of various aspects of clove cultivation and production in the Zanzibar Protectorate is a chapter (VIII, pp. 137–156) on the diseases and pests of the crop, referring, *inter alia*, to sudden death [*R.A.M.*, 27, p. 276], die-back [ibid., 16, p. 301], the rôle of the minor elements, and virus diseases. The low content of calcium and phosphate and high content of manganese in the Zanzibar clove soils compared with normal calcium and phosphate values and somewhat high manganese values for healthy clove soils in Mauritius suggests that die-back may possibly be due to calcium deficiency, judging from the calcium values involved.

Report of the Department of Hop Research, Wye College, Ashford, Kent, 1948.—55 pp., 1949.

In this report [cf. *R.A.M.*, 18, p. 295] it is stated that the several hop seedlings bred at Wye and found by Dr. Keyworth at East Malling to be resistant to *Verticillium* wilt [*V. albo-atrum*: ibid., 28, p. 358] were all derived from either a wild Canadian or a New Mexican male plant, both of which are now dead. About 30 other male plants having a similar ancestry have been traced, however, and they are to be tested for wilt resistance as soon as sufficient plants of each are available.

F. C. THOMPSON (pp. 25–29) reviews the literature on the connexion between diseases of the hop plant and soil conditions with special reference to *V. albo-atrum* and nettlehead [ibid., 27, p. 25].

N. H. PIZER, E. G. CRIPPS, and F. C. THOMPSON (pp. 32–48) present the results of extensive soil and nutritional investigations carried out at Wye from 1944 to 1947 in connexion with *V. albo-atrum*. Analyses of apparently healthy leaf laminae and petioles from healthy and infected gardens in 1945 and of petioles in 1946 showed that calcium and silicon were higher in Fuggle hops from infected gardens and nitrogen lower. There were also significant differences between the figures for 'moisture absorption' (a determination of the residual moisture content of air dry leaf tissue), which is considered to indicate a difference in the physical properties of the hop leaf tissues.

Although several elements are involved in the nutritional differences, calcium appears to differ most consistently in all comparisons. Examination of soil analytical data and of soil profile characters showed no significant differences between the soils in healthy and infected gardens. The level of petiole calcium, therefore, does not appear to be affected by the level of soil calcium and the results obtained on special sites at East Malling and Beltring in 1946 and 1947 emphasize this point. Experiments must be made to determine whether there are high and low calcium strains of Fuggles and whether those with low calcium levels in the leaves and petioles are less susceptible to *V. albo-atrum*.

MCMARTIN (A.). **Present developments in the search for new Sugarcane varieties for Natal.**—*S. Afr. Sug. J.*, 33, 1, pp. 35, 37, 39, 41, 1949.

The importation into South Africa of foreign sugar-cane varieties to replace Uba, now almost entirely eliminated from commercial cultivation, has introduced some

new factors into the varietal problem, including reaction to disease in relation to local conditions. Increasing knowledge of the distribution of diseases in Natal has shown that resistance to a particular pathogen may be of more importance in one area than in another. For instance, at high altitudes where mists are prevalent, red rot [*Physalospora tucumanensis*: *R.A.M.*, 27, p. 157] may assume epidemic proportions in a susceptible variety, which in drier localities will be little affected. The sugar-cane mosaic virus is seldom found on sandy soils near the sea, whereas smut [*Ustilago scitaminea*: ibid., 28, p. 196] is more prevalent along the coast than inland. The root rot complex is usually associated with low soil temperatures, high rainfall, and an exceptionally high organic matter content of the soil. Such conditions stimulate the by-products of decomposition, which are formed in unusual abundance, retarding root development and encouraging invasion by root-rotting soil organisms in the case of a susceptible variety like Co. 281. On the other hand, some varieties that have shown no promise at the Experiment Station appear to thrive under conditions conducive to root rot. It is apparent from these examples that the requirements of different localities are highly specialized.

Discussing the application of varietal research to the development of new types, the author points out that all varieties originating from the 'noble' group, *Saccharum officinarum*, are susceptible to mosaic and many also to the sugar-cane streak virus, while most ratoon badly. The varieties best adapted to exacting requirements are those of a complex hereditary constitution derived from trispecific crosses between *S. officinarum*, *S. spontaneum*, and *S. barberi*. The wild type *S. spontaneum* imparts mosaic resistance to members of the *S. officinarum* group and at the same time produces a hardier cane, such as the P.O.J. types, which are, however, of only limited value for local cultivation. The varieties that have done best in Natal are those with some of the Indian *S. barberi* in their constitution, with or without an admixture of *S. spontaneum*. Indeed, Co. 301 resulted from a cross between *S. officinarum* and *S. barberi* only.

Caminha (A.). **O carvão da Cana Açúcar (Ustilago scitaminea (Rab.) Syd.)** [Sugar Cane smut (*Ustilago scitaminea* (Rab.) Syd.)]—*Brasil-açúc.*, 32, 3–4, pp. 348–350, 1948.

In connexion with the appearance of sugar-cane smut (*Ustilago scitaminea*) in the Assis district of São Paulo, Brazil [*R.A.M.*, 28, p. 83], the author summarizes the available information on the disease and its control, with special reference to experience gained in Argentina. In his opinion, smut is likely to cause less damage in Brazil than two other diseases occurring sporadically in the State of Rio and in São Paulo, namely, leaf scald *Phytomonas* [*Xanthomonas*] *albilineans* and 'pokkahboeng' (*Fusarium moniliforme*) [*Gibberella fujikuroi*: cf. ibid., 27, p. 44].

Veiga (F. M.). **Tratamento de toletes de Cana com fungicidas.** [Treatment of Cane cuttings with fungicides.]—*Brasil-açúc.*, 32, 3–4, pp. 352–355, 2 figs., 1 diag., 1948.

An experiment is described, and its results statistically analysed, in which sugarcane cuttings of the C.B. 38–22 variety were treated with four fungicides (all at 2 per cent.) for the control of red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*], which killed a stand of 25 ha. in a factory plantation in the Campos district of the State of Rio, Brazil [*R.A.M.*, 26, p. 219] in April, 1948, causing serious financial loss. Abavit proved to be the most effective, resulting in a germination percentage of 45·3 per cent., compared with 14·8 per cent. in the controls, the corresponding figures for semesan, agrosan, and granosan being 40·3, 37·8, and 29·3 per cent., respectively. Since a 50 per cent. stand is the best that can be expected in the poorly drained clay soils of the locality, the abavit and semesan treatments may be considered definitely beneficial.

SUMSTINE (D. R.). **The Albert Commons collection of fungi in the herbarium of the Academy of Natural Sciences in Philadelphia.**—*Mycologia*, 41, 1, pp. 11–23, 1949.

This collection of more than 4,000 specimens collected from 1842 onwards by Albert Commons, mostly in Delaware, and stored in the Academy of Natural Sciences, Philadelphia, is now available to mycologists for study and should prove a rich field for investigation. The author presents a list of Hyphomycetes with the name of the species, collection number, host, locality, and the date to give a general idea of the collection.

ZELLER (S. M.). **Notes on certain Gasteromycetes, including two new orders.**—*Mycologia*, 40, 6, pp. 639–668, 1948.

This list of Gasteromycetes comprises nine orders, including two new ones, six new families, 20 new combinations, one new genus, and six new species. Systematic notes are given on each. The type and other material was mostly supplied by the New York Botanical Garden.

ZELLER (S. M.). **Keys to the orders, families, and genera of the Gasteromycetes.**—*Mycologia*, 41, 1, pp. 36–58, 1949.

Keys are presented to the orders, families, and genera of the Gasteromycetes [see preceding abstract], primarily for plant identification, without particular emphasis on relationships. They include all the genera considered acceptable by the author. Relevant literature of 38 titles is appended.

DA CÂMARA (E. DE S.). **Contributiones ad mycofloram Lusitaniae. Centuria XII.** [Contributions to the mycoflora of Portugal. Twelfth hundred.]—*Agron. lusit.*, 8, 1, pp. 19–67, 3 pl., 1946. [Received March, 1949.]

Included in this further critically annotated contribution to the knowledge of Portuguese fungi [cf. *R.A.M.*, 25, p. 47] are *Cucurbitaria yuccae* and *Cylindrocolla longispora* n.sp. on *Agave americana*; *Phyllosticta brassicicola* on cabbage; *P. buxina* on box [ibid., 25, p. 194]; *Septoria crateriformis* on *Phillyrea angustifolia*; and *S. iridis* on *Iris germanica* [ibid., 24, p. 476].

GOIDÀNICH (G.), RUGGIERI (G.), & GAGNOTTO (ANNA.). **Presenza di una terza forma di moltiplicazione agamica in Deuterophoma tracheiphila Petri.** [The presence of a third type of agamic fructification in *Deuterophoma tracheiphila* Petri.]—*Ann. Sper. agr.*, N.S., 2, 5, pp. 671–675, 4 figs., 1948. [English summary.]

After describing the normal process of conidial formation in *Deuterophoma tracheiphila* [*R.A.M.*, 27, p. 318], the authors report that on artificial and natural media (sterilized wood) and on pieces of infected tissue kept in a damp chamber they also observed the formation of other conidia differing from the usual ones in shape and size. These appeared in young colonies, particularly in those which grew with difficulty, and suddenly turned bright red. The hyphae at an apical or intercalary point swell and from this swelling new cells arise by budding, and these bud, in their turn, the ones last formed becoming detached. As detachment occurs at different stages of maturation the conidia are of different shapes and sizes, but for the most part they are ovate, subpyriform, uni- or bicellular, with several vacuoles, and average 15 to 17 by 7 to 9 μ. The fertile hyphae of this type of fructification may exist singly but are generally united in groups resembling a sporodochium.

The function of this fructification is, apparently, to provide a quick means of reproduction. This view is supported by the fact that the process usually occurs in

colonies where growth is difficult and which do not, as a rule, complete pycnidial fructification, and complete hyphal fructification only to a limited extent. Identical or very similar conidia were also found in naturally infected tissues, particularly in the youngest xylem elements, and they may, perhaps, be responsible for the diffusion of the disease throughout the host [cf. ibid., 27, p. 70].

COOK (M. T.). **Species of Synchytrium in Louisiana. V. A new species on Sambucus canadensis.**—*Mycologia*, 41, 1, pp. 24–27, 9 figs., 1949.

A brief description is given of the symptoms and morphology [with a Latin diagnosis] of a new species of *Synchytrium*, *S. sambuci*, found in Louisiana on young leaves of elder plants (*Sambucus canadensis*).

BEST (R. J.). **Further studies on the physical states assumed by Tobacco mosaic virus in vitro.**—*Aust. J. exp. Biol. med. Sci.*, 25, 3, pp. 283–290, 3 figs., 1947.

Data concerning the physical states assumed by pure preparations of tobacco mosaic virus [see next abstracts] at various concentrations of virus and sodium chloride are presented and discussed [cf. *R.A.M.*, 20, p. 137]. Isotropic sols are obtained in the absence of salt if the virus concentration is less than about 1 per cent., a two-phase system of isotropic sol and birefringent crystalline liquid in equilibrium if the over-all concentration of virus is between 1 and 2 per cent., and only the birefringent liquid phase at higher concentrations. At a low salt concentration ($<0{\cdot}01$ M for univalent salts) the sequence is the same but the limiting virus concentrations are higher. At intermediate salt concentrations (roughly between 0·1 and 1 N), the virus is precipitated slowly in the form of birefringent tactoids, consisting either of long, flexible fibres or of shorter aggregates. At high salt concentrations (0·5 N and upwards) the virus is precipitated from solution in the form of birefringent microtactoids.

BEST (R. J.). **The constancy of chemical composition and infectivity per unit weight of Tobacco mosaic virus protein prepared over a period of years.**—*Aust. J. exp. Biol. med. Sci.*, 26, pp. 65–69, 1948.

In experiments carried out at the Waite Agricultural Research Institute, University of Adelaide, ten samples of ordinary tobacco mosaic virus [see preceding and next abstracts] from artificially infected Blue Pryor tobacco plants harvested at various times over a period of five years showed a high degree of uniformity, especially in phosphorus and nitrogen content. Infectivity tests of 17 samples of the virus harvested over a period of nine years showed that there was no significant difference between the infectivity per unit weight.

BEST (R. J.). **Longevity of Tobacco mosaic virus. Part I. In vitro life of the pure virus in buffer solution at pH 4.**—*Aust. J. exp. Biol. med. Sci.*, 26, pp. 163–169, 1 graph, 1948.

In experiments carried out at the Waite Agricultural Research Institute, University of Adelaide, the infectivity of a sample of pure tobacco mosaic virus [see preceding abstracts], prepared from infective juice from artificially infected Blue Pryor tobacco plants by precipitation at its iso-electric point and suspended in buffer solution at pH 4, showed no significant change, as measured by the number of primary lesions produced by a very dilute solution on leaves of *Nicotiana glutinosa* plants, over a 12-year period (1935 to 1947). The infectivity of standard inocula of pure virus containing 1×10^{-6} gm. virus per ml. used as an additional and more quantitative measure during the last $9\frac{1}{2}$ yrs. of the test also remained unchanged.

Williams (R. C.) & Steere (R. L.). **Electron micrograph observations of Tobacco mosaic virus in crude, undiluted plant juice.**—*Science*, 109, 2830, pp. 308–309, 2 figs., 1949.

In electron micrographs of the expressed, crude juice of a wild strain of tobacco mosaic virus from White Burley plants, the virus particles appear (in 14-day-old infections) in the form of large bundles or sheaves, roughly 1 to 3 μ long by 150 mμ wide [cf. *R.A.M.*, 26, p. 267]. The size and frequency of the forms increase with the age of the infection, being barely perceptible 36 hours after inoculation. Previous failures to recognize the sheaves of virus particles may have been due to the washing of specimens with two drops of distilled water before allowing to dry and shadowing with uranium. This procedure results in extensive disintegration of the bundles and in the detachment of typical single particles from the larger groups. These particles may very well be identical with the needle forms seen in the optical microscope. Further work is necessary to determine whether the groups of virus particles exist as such in the intact plant cells, in which case they might represent the geometrical growth pattern of the virus, or develop as aggregates of the individual particles, subsequent to the crushing of the cells.

Van der Ven (L. F. J. M.). **De teelt van Tabak.** [Tobacco cultivation.]—*Meded. TuinbVoorlDienst*, 46, 93 pp., 20 figs., 1949.

Included in this valuable handbook dealing with various aspects of tobacco cultivation in Holland is a section on the symptomatology, etiology, and control of the diseases of the crop (pp. 68–80) caused by viruses (tobacco mosaic and rattle [*R.A.M.*, 28, p. 87]); fungi (*Cercospora nicotianae*, *Thielavia* [*Thielaviopsis*] *basicola* [ibid., 28, p. 89], *Sclerotinia libertiana* [*S. sclerotiorum*: ibid., 25, p. 83], *Alternaria tenuis*, *Botrytis cinerea* [loc. cit.], and various agents of damping-off, among them *Pythium debaryanum* and *Rhizoctonia* [*Corticium*] *solani*); bacteria (*Pseudomonas tabaci*, *P. angulata*, and *Erwinia nicotianae* [ibid., 26, p. 135]); deficiencies of potash, nitrogen, phosphorus, and magnesium [ibid., 16, p. 781]; and unknown factors ('speck' or 'stipple' and frenching [ibid., 28, pp. 251, 380], the latter observed for the first time in the country in 1948).

The development of *P. tabaci* and *P. angulata* is promoted by cold weather and strong winds in the spring, such as prevailed in 1948. Control may be effected by seed disinfection with 0·1 per cent. silver nitrate (five to ten minutes' immersion) [ibid., 9, p. 119 *et passim*] and spraying with 0·5 per cent. Bordeaux mixture.

Boron deficiency has not yet been recognized with certainty in Holland, but its occurrence was suspected in 1948 in a tobacco crop on sandy soil in North Brabant, where beets suffer from heart rot and swedes from brown heart, both manifestations of a shortage of this element. A similar condition affecting tobacco in Indonesia is known as 'top rot'.

Schoevers has described the symptoms of 'speck' as consisting of minute, pale natural-coloured to nearly white or light brown spots the size of a pin head, dotted over the leaves [cf. ibid., 12, p. 205; 27, p. 201]. The epidermis of the specks on both leaf surfaces is intact and the tissue is shrunken, resulting in the formation of small pits with sharply raised edges, especially on the under side. The disorder was observed on several plots in 1948.

A number of moulds and bacteria, known collectively as 'barn mould' or 'barn rot' [ibid., 27, p. 118], are concerned in spoilage of the leaves during the curing process in inadequately or improperly ventilated barns.

Other references to phytopathological matters occur in the sections on seed-bed sterilization; sowing and care of the seed-bed; clearing away the stripped stalks after harvesting, with a note by O. de Vries on the perpetuation of *Phytophthora* [*parasitica* var.] *nicotianae* on plant debris in Sumatra (this is also applicable in Holland to *S. sclerotiorum* and certain virus diseases, e.g., mosaic and rattle); and

seed disinfection, describing the application of the silver nitrate method devised at the Tobacco Research Institute, Forchheim [Germany].

GIGANTE (R.). **Le malattie batteriche e crittogamiche dei semenzai di Tabacco.** [Bacterial and fungal diseases in Tobacco nurseries.]—*Tabacco*, 53, 594, pp. 3–29, 25 figs., 1949.

The author describes the symptoms, morphological and cultural characteristics of the causal organisms, and methods of controlling the principal diseases affecting nursery tobacco, namely, *Pythium debaryanum* [*R.A.M.*, 26, p. 422], black root rot (*Thielaviopsis basicola*) [ibid., 28, p. 5], *Olpidium brassicae* [ibid., 26, pp. 531, 570], black shank (*Phytophthora parasitica* var. *nicotianae*) [ibid., 27, p. 390], *Peronospora tabacina* [ibid., 28, p. 313], *P. nicotianae* [ibid., 21, p. 226], and *Rhizoctonia* [*Corticium*] *solani* [ibid., 27, p. 586]. General notes on correct cultural methods and sanitation as a means of controlling diseases in the nursery are given.

STEINBERG (R. A.) & CLAYTON (E. E.). **Chemical soil treatment for black root rot of Tobacco in the greenhouse.**—*Phytopathology*, 39, 2, pp. 155–157, 1949.

Of the compounds tested at the Plant Industry Station, Beltsville, Maryland, for control of black root rot (*Thielaviopsis basicola*) on Maryland Broadleaf tobacco seedlings, grown in the greenhouse at day and night temperatures of 65° to 75° and 50° to 60° F., respectively, in crocks filled with a half-and-half mixture of infested and sterilized soil, urea in its commercial form of uramon [*R.A.M.*, 21, p. 167; 27, p. 340], sodium azide, hexamethylenetetramine, and sodium nitrite gave the most encouraging results.

Urea at 12 gm. per 1-gal. crock (1 lb. per sq. yd.), and frequently at 6 gm., conferred satisfactory protection on the first crop of seedlings grown in the soil, though usually accompanied by slight stunting and some mortality. Slight infection tended to develop on some of the roots of a second planting of seedlings in the same soil. Sodium nitrite (12 gm.) appeared to be more effective than urea on replanting, but was somewhat toxic to the seedlings unless leached from the soil by several thorough waterings between the two crops. Hexamethylenetetramine gave a measure of control at 9 gm. in both crops, but was more injurious than urea, stunting or killing first-crop seedlings. It should be thoroughly leached from the soil. Sodium azide, the most effective of all the chemicals tested, controlled the disease in both crops at dosages of 0·5 to 1 gm. per crock, but here again leaching is essential to obviate damage from toxic residues. Unlike hexamethylenetetramine, sodium azide is very poisonous to livestock and cannot be recommended for general use until this hazard has been eliminated. It also forms explosive compounds with metals such as copper.

An attempt was made to enhance the efficacy of urea, the cheapest of the effective compounds and a source of nitrogen, by combination with sodium azide, hexamethylenetetramine, or dichloramin T, but no synergistic effects could be observed.

KENDRICK (J. B.) & WALKER (J. C.). **Predisposition of Tomato to bacterial canker.**—*J. agric. Res.*, 77, 6, pp. 169–186, 4 figs., 14 graphs, 1948.

In experiments carried out in Wisconsin potted Bonny Best tomato plants were predisposed to various environments for five to six weeks before inoculation with a concentrated saline suspension of the bacterial canker organism (*Corynebacterium michiganense*) [*R.A.M.*, 27, p. 393] cultured in tomato plants. The minimum, optimum, and maximum temperatures for growth of the organism in nutrient dextrose broth were 4°, 32°, and below 36° C. Plant growth was best in soil at 24° or 28° when the air was at 16°, 20°, or 24°, with a maximum when both soil and air temperatures were 24°.

At air temperatures of 16°, 24°, and 28°, maximum disease occurred where soil temperatures were 24° or higher, that is when plants developed at favourable temperatures. At 16° soil temperature the disease was markedly retarded. Plants predisposed for 31 days at 16°, 24°, 28°, and 34° soil temperature, all being held at an average air temperature of 20° and optimum soil moisture for host development, were inoculated with the organism. Plants from each set were grown on at the four soil temperatures. Maximum disease development occurred at a post-inoculation soil temperature of 28°. Plants predisposed at 24° (soil) succumbed to the disease less rapidly than those predisposed at higher or lower soil temperatures. Next came those predisposed at 16°, while those at 28° and 34° were the most susceptible. Thus plants predisposed at soil temperatures which promoted maximum development before inoculation, were best able to resist the disease at a soil temperature which was optimum for disease development. Cankers were most frequent on succulent plants grown at higher pre-inoculation temperatures and then grown on at lower temperatures.

Plants predisposed for five weeks at air temperatures of 16°, 20°, 24°, and 28° with soil temperatures ranging from 1° to 4° below these, received post-inoculation air temperatures of 16°, 20°, 24°, and 28°. Plants predisposed at 24° showed the greatest resistance to disease at post-inoculation temperatures of 16°, 20°, and 24°. Maximum disease development occurred at a post-inoculation temperature of 28° C.

Plants were grown at high (slightly below 100 per cent. water-holding capacity), optimum (80 per cent.) and low (40 per cent.) soil moisture levels at 28° air temperature for 28 days and then inoculated. Plants from each predisposition treatment were given post-inoculation treatments of low, optimum, and high soil moisture. In the plants predisposed at optimum moisture, the progress of the disease after inoculation was slightly more rapid in the optimum and low moisture groups. The plants predisposed at high moisture and maintained at the same level after inoculation had the lowest final disease index sometimes showing no symptoms until the soil was allowed to dry out. After inoculation the most vigorous plants usually became most susceptible to disease; those predisposed at optimum soil moisture and later allowed to dry out being the first to become diseased.

Plants predisposed for 30 days at low light intensity (40 to 700 ft. candles) became diseased more rapidly than those predisposed at normal light intensity (100 to 1,600 ft. candles) regardless of the intensity after inoculation; those in normal light after inoculation made the fastest growth and developed the disease most rapidly. In plants inoculated when 38, 46, 60, and 76 days old the disease progressed at the same rate but symptoms appeared more promptly and were more severe in the youngest than in the oldest plants.

The predisposing effect of soil and air temperature and soil moisture on the host plant in its reaction to the canker pathogen was almost diametrically opposite to that of the same factors on the host in its reaction to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: ibid., 26, p. 473].

Braun (A. C.). **The role of thiamin and certain related compounds in pigment production by Corynebacterium michiganense (Erw. Smith) Jensen.**—*Phytopathology*, 39, 2, pp. 171–172, 1949.

When two isolates of *Corynebacterium michiganense* [see preceding abstract] from tomato were cultured on certain media, e.g., dextrose agar, excellent growth was made at 25° C. but there was no trace of the characteristic yellow pigment. However, the addition to the medium of 1 to 2 per cent. yeast extract resulted in pigment production. Of various vitamins of the 'B' complex tested as substitutes for the yeast extract, only thiamine HCl at concentrations of 100 mg. to 1 mg. per l. medium induced the typical yellow pigmentation: in the presence of 0·1 mg. of the

compound a cream-coloured growth developed. The thiazole fraction of the thiamine molecule was capable of replacing the thiamine, whereas the pyrimidine portion was ineffectual. A sample of γ hydroxypropyl thiazole was inactive. Cocarboxylase was effective in the same concentration as thiazole. A white mutant of *C. michiganense* [*R.A.M.*, 9, p. 420] did not respond to thiamine.

CROUCHER (H. H.). **Administration Report of the Director of Agriculture, British Guiana, for the year 1946.**—19 pp., 1949.

On p. 11 of this report [cf. *R.A.M.*, 19, p. 326] it is stated that in trials in British Guiana to find a high-yielding tomato variety resistant to wilt [*Fusarium bulbigenum* var. *lycopersici*: ibid., 11, p. 26; 27, pp. 120, 454] only Grand Rapids and Hastings Super Marglobe showed any resistance. The Costa Rican varieties No. 0149 and No. 81 gave no promise in this respect.

BALDASSINI (C.). **Di un' alterazione di polloni di Castagno dovuta ad una specie di Endothia.** [On an affection of Chestnut shoots due to a species of *Endothia*]—*Ann. Sper. agr.*, N.S., 2, 5, pp. 677–686, 4 figs., 1948. [English summary.]

In the summer of 1947, the author examined chestnut shoots from the province of Frosinone, Italy, bearing numerous, distinct or confluent, round, raised pustules 1 mm. in diameter, and 0·5 mm. high. The periderm covering them was cracked in places, revealing a pulverulent, orange-yellow content. The infection killed the affected parts and later on the whole shoot. The pulverulent mass consisted of hyaline conidia. The pustules themselves were stromata containing pycnidia. The pycnidial chamber ranged from 30 to 100 μ in diameter and was lined with hyaline, cylindrical or subclavate conidiophores 8 to 12 μ long. The characters were those of an *Endothia*, but not of *E. parasitica* [see next abstracts].

In culture on white maize flour agar at 25° C. the fungus produced after three days a white mycelium with a faint orange spot near the point of inoculation; later, the mycelium became orange-yellow. After four weeks the whole surface of the agar was covered with mycelium and orange-yellow stromata with pycnidia had developed, measuring 1 to 2 mm. in diameter and 0·5 to 1·5 mm. high. The medium under the mycelium had slowly turned purplish-red. On potato agar the fungus made similar but much slower, patchy, sterile growth and after four weeks did not cover the surface of the medium. On carrot agar growth was quicker than on potato but slower than on maize flour. The mycelium became orange-yellow after one week and after five weeks the whole surface of the medium was covered with a thick mat. Pycnidial stromata developed, producing cirri of pycnoconidia. The agar was very faintly reddish where the mycelium came into contact with the glass. In parallel cultures on the same media *E. parasitica* displayed quite different characters.

From a comparison of the cultural characters with those described for other species of *Endothia* on the same media the author concludes that the fungus is *E. fluens*, with which it agrees perfectly, in the conidial state. The affected trees were growing in very poor soil and it appears that in such conditions the fungus (generally regarded as a saprophyte) can behave as a weak parasite.

BIRAGHI (A.). **Prove di inoculazione di Castagni con Endothia sp. isolata in Biscaglia.** [Inoculation experiments on Chestnuts with a species of *Endothia* isolated in Biscay.]—*Ann. Sper. agr.*, N.S., 2, 5, pp. 687–691, 1948. [English summary.]

In the winter of 1947–8 the author visited the locality in Biscay, Spain, where chestnut trees were reported to be infected by *Endothia parasitica* [*R.A.M.*, 27, p. 590 and next abstract]. Tamba (*Castanea crenata*) trees about 25 years old showed

evidence of long-standing infection, the fungus being localized, however, in the outer cortical layers, as a result of the defensive cork barriers laid down by the trees. Near the Tamba trees were plantations of the Shika variety of *C. crenata*, *C. mollissima*, *C. koraiensis*, and *C. sativa* which showed no sign of infection even in the immediate vicinity.

Cultures from infected material possessed the same characters as Italian strains of *E. parasitica* and in experimental inoculations in Italy with a number of Spanish strains of the fungus (including that from one infected *C. sativa* tree found) and with an Italian strain the former showed the same behaviour and the same degree of virulence as the latter. From this it is concluded that the fungus found in Biscay is *E. parasitica*. Further studies are in progress.

Picco (D.). **Ricerche sulla biologia dell' Endothia parasitica (Murr.) Anderson in Italia.** [Researches on the biology of *Endothia parasitica* (Murr.) Anderson in Italy.]—Reprinted from *Ital. for. mont.*, 3, 5, 7 pp., 2 figs., 1948.

When pycnidiospores of *Endothia parasitica* [see preceding abstracts] from young chestnut trees (*Castanea vesca*) near Pavia were grown on chestnut bark agar, white, hairy, fan-shaped colonies developed, resembling the growth observed on the bark of the affected trees. Later, orange-yellow stromata 0·5 to 3 mm. [in diameter] formed on the mycelium and after 50 to 60 days became covered with an amber mucilage. On potato agar after three days the colonies developed an orange-yellow, deeply sunk centre, around which stromata 0·2 to 1·5 mm. in diameter later developed in concentric rings, the more remote ones being the largest. These rings gradually became more widely spaced, whitish-yellow mycelium appearing between them. After one week drops of mucilage appeared on the older stromata. With age, the stromatic rings darkened and the mycelium became orange-yellow. The hyaline, cylindrical pycnidiospores with rounded extremities were straw-yellow in the mass, averaging both in culture and on the host (2·3) 2·99 to 4·14 (6·9) by (0·69) 1·15 to 2·07 (2·3) μ.

From these features and also from the cultural and pathogenic characters (to be described later), the author concludes that the Italian strain of *E. parasitica* is identical with the American.

Pavari (A.). **Chestnut blight in Europe.**—*Unasylva*, 3, 1, pp. 8–13, 3 figs., 2 maps, 1949.

The author notes (and maps) the spread of *Endothia parasitica* on chestnut [see preceding abstracts] in Italy since it was first reported there in 1938, describes (and maps) the distribution of the cultivated chestnut in Europe, and gives details of its economic importance in Italy. The present incidence of infection there and the campaign against the disease are reviewed. Research in Italy falls into four main categories: (1) preventive and curative experiments, (2) the search for resistant varieties, (3) the introduction of oriental chestnut species, and (4) hybridization. It is hoped to establish a special chestnut research centre.

Went (Johanna C.). **Verslag van de onderzoekingen over de Iepenziekte en andere boomziekten, uitgevoerd op het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn, gedurende 1948.** [Report of the investigations on the Elm disease and other tree diseases carried out at the Phytopathological Laboratory 'Willie Commelin Scholten', Baarn, during 1948.]—*Meded. Inst. toegep. biol. Onderz. Nat.* 44, 15 pp., 1949. [English summary.]

Of seeds of 50 hybrids, resulting from crosses between individuals with the maximum resistance to Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, 28, p. 40], taken from more than 30 elm plants and sown between 1940 and 1945, 14 comprised over 10 per cent. healthy seedlings. The most resistant of these hybrids

with a good growth habit were selected for further grafting and inoculation. Four of the nine best originated from crosses between *Ulmus hollandica vegeta* and *U. carpinifolia*.

The inoculation of various elm selections with *Nectria cinnabarina* caused no dying-off in 1948.

The spruce (*Picea abies*) disease was observed in several new localities, where the infected needles yielded the same fungi as in 1947 [loc. cit.]. The fungus previously named *Phoma* is now thought to be either a *Leptostroma* or *Leptothyrium*, possibly imperfect states of *Lophodermium*, while another has been identified as a *Brunchorstia*.

WALLER (S.). **Preliminary notes on a new fungus disease of Sycamore.**—*Essex Nat.*, 28, 3, pp. 136–138, 1949.

During 1946 the author observed a single dead sycamore (*Acer pseudoplatanus*) in Wanstead Park [Essex], the bark of which had fallen off and the wood beneath was entirely covered by a thick black deposit of [unidentified] fungus spores. Two years later it appeared that the fungus was a very aggressive parasite since about 40 sycamore trees were dead or dying as a result of its attacks. The pathogen appears to invade the bark and cambium and once it is established the bark drops off leaving the wood encrusted with a thick layer of spores. These are so prolific that pounds could be scraped off a single tree; the surrounding vegetation is blackened by them. An affected tree shows no outward sign of the disease until the bark begins to drop off, by which time it is apparently too late to save it. Such a disease has not previously been recorded on sycamore.

POMERLEAU (R.). **Les caries du Sapin.** [Fir rots.]—Reprinted from *For. québ.*, 13, 7, 8 pp., 13 figs., 1948.

This is a popular account of the economic importance of fir [*Abies* spp.] trees in Quebec and the damage caused to them by various heart and root rots [*R.A.M.*, 26, p. 37], especially red heart rot [*Stereum sanguinolentum*: ibid., 24, p. 298], feathery butt rot [*Poria subacida*: loc. cit.], and brown cubical butt rot [*Polyporus schweinitzii*: ibid., 9, p. 421]. Rots are present in nearly 30 per cent. of the trees before they are 40 years old and more than 80 per cent. of those still standing when 100 years old carry some sign of rot. In old plantings it is very rare to find a single tree over 150 years old that is completely intact. Nevertheless, the losses scarcely exceed 5 per cent. at 40 years, 15 per cent. at 80 years and 25 per cent. at 125 years. In order to reduce these losses as far as possible the author advises that trees with bad wounds should be utilized as soon as possible before the rot organisms gain entry and that trees should not be allowed to grow too long beneath a dense, leafy canopy.

WITTE (A.). **Skadegörelse på Douglas-Gran.** [Damage done to Douglas Fir.]—*Svenska SkogsFören. Tidskr.*, 46, 1, pp. 10–18, 7 figs., 1 map, 1948.

In addition to two pathogens already recorded on Douglas fir (*Pseudotsuga taxifolia*) in Sweden, namely, *Phomopsis pseudotsugae* [*R.A.M.*, 14, p. 483] and *Rhabdocline pseudotsugae* (Lagerberg, Kompendium i skoglig mykologi, 1942), the writer observed two parasites in Scania (extreme south of the country), namely, *Phaeocryptopus gaeumanni* and the woolly aphis *Gilletteella* (formerly *Chermes*) *cooleyi*, several times in association on the same tree. Eight out of the 13 stands (besides single trees) inspected were severely attacked by the fungus, which in some cases occurred in small, isolated plantings. Some of the diseased trees had been largely defoliated and a few were dead. By itself the woolly aphis is unlikely to be of great importance in Sweden, but it may well contribute to the destruction

of trees when the assimilatory capacity of the needles has been weakened by external factors or parasitic agencies.

In Denmark, the only neighbouring country to harbour *P. gaeumanni* [ibid., 25, p. 86], Buchwald has questioned the wisdom of laying down new plantations of Douglas fir pending further developments, and a similar policy might with advantage be followed in Sweden.

Schubert (W. J.) & Nord (F. F.). **On the mechanism of enzyme action. XXXV. A relationship between ergosterol formation in Lentinus lepideus and lignification.**—*Arch. Biochem., N.Y.*, 20, 2, pp. 465–472, 1949.

The wood-destroying fungus, *Lentinus lepideus*, produces ergosterol from glucose and ethyl alcohol, the sterol accounting for some 0·3 per cent. of the weight of the fully developed mycelial mat. Further evidence is presented to illustrate the essential function of acetaldehyde in the over-all carbohydrate metabolism of the fungus [*R.A.M.*, 27, p. 167]. It appears probable that enzyme systems similar to those present in *L. lepideus* are instrumental in the process of lignification.

Bier (J. E.), Salisbury (P. J.), & Waldie (R. A.). **Studies in forest pathology. V. Decay in Fir, Abies lasiocarpa and A. amabilis, in the Upper Fraser Region of British Columbia.**—*Tech. Bull. Dep. Agric. Can.* 66, 28 pp., 5 pl., 8 graphs, 1 map, 1948.

Continuing their forest surveys in Canada [cf. *R.A.M.*, 26, p. 433] the authors present the results of a sampling study in over-mature mixed stands of spruce (*Picea glauca* and *P. engelmanni*) and fir (*Abies lasiocarpa* and *A. amabilis*) in the Upper Fraser Region of British Columbia. All fir logs of saw-log size (trees 11 in. breast height diameter and over, to an 8 in. top) and of pulpwood size (all trees yielding a minimum of one 16 ft. log to a 4 in. top), which occurred on 25 one-acre sample plots were scaled in board and cubic feet and analysed for loss through decay.

There were, on the average per acre, 25 firs of saw-log size with an average gross merchantable volume of 4,474 board feet (British Columbia Log Rule) and an average recoverable volume of 3,164 board feet or 7·3 cords (using a culling procedure practised in Eastern Canada and the United States). Of the sawlogs cut 40 per cent. were sound and a further 44 per cent. were recoverable with deductions for decay.

On a pulpwood basis an average of 70 trees per acre yielded an average gross merchantable volume of 1,271 cu. ft. or 12·7 cords per acre. About 18 per cent. of this volume (on the Western basis for cull) and 43 per cent. (on the Eastern basis) was lost from decay.

The results indicated a relationship between age and decay. The pathological rotation for fir as indicated by the period of maximum net periodic increment occurred in trees from 121 to 140 years old. Without a long period of early suppression (such as was present in these stands) fir attains saw-log size in less than 130 years. On the average decay increased with increasing diameter. Local volume tables are presented to indicate the decay losses in board and cubic feet that should be deducted from fir in the different diameter classes.

Of the 21 wood destroying fungi found to be associated with decay of living fir, brown stringy rot (*Echinodontium tinctorium*) [*R.A.M.*, 20, p. 435], and red heart rot (*Stereum sanguinolentum*) [ibid., 19, p. 433, and above p. 429] together accounted for 87 per cent. of the damage; the latter fungus was the most important decay agent in this region, having caused 46·8 per cent. of the total cull. Owing to the similarity in the decay caused by these pathogens as seen in transverse section they have probably often been confused in the past. Their relative importance was assessed by cultural studies.

Sporophores usually occur on firs infected by *E. tinctorium* and serve as an external symptom of this disease. Decayed trees without large sporophores are probably infected by *S. sanguinolentum*, the small fruiting bodies of which are inconspicuous and occur in living trees only on scars and dead branches.

WEBB (P. C. R.). **Zoosporangia, believed to be those of Plasmodiophora brassicae, in the root hairs of non-cruciferous plants.**—*Nature, Lond.*, 163, 4146, p. 608, 1949.

In 1936 the author observed zoosporangia identical with those of *Plasmodiophora brassicae* [*R.A.M.*, 27, p. 464] in root hairs of potted grass and dock [*Rumex* sp.] seedlings, growing in soil originating from a garden infested with the parasite. When club root galls with mature spore masses were placed in pots containing seedlings of Brussels sprouts they became infected and the root hairs of *Holcus lanatus* growing in the same pots contained numerous zoosporangia and some zoospores. Twenty of these root hairs, after careful washing in distilled water, were removed to pots of sterile soil; ten out of 12 seedlings of Brussels sprouts became infected apparently with *P. brassicae*, while all plants in the control pots remained healthy. The cycle in zoospore formation in root hairs appeared to be identical with that in cruciferous roots.

In July, 1948, the author found similar zoosporangia in two root hairs of Auchincruive Climax strawberry plants in Hampshire, where club root had been prevalent.

The presence of *P. brassicae* in non-cruciferous hosts has been suspected in the past, notably by Marchand (*C.R. Acad. Sci., Paris*, 150, p. 1349, 1910). It is hoped that cross-inoculation experiments will establish the identity of the zoosporangia and the host range of *P. brassicae*.

POUND (A. E.). **Annual Report of the Department of Agriculture, Seychelles, 1945.** —11 pp., 1949.

On p. 6 of this report [cf. *R.A.M.*, 17, p. 299] it is stated that the incidence of cabbage black rot (*Bacterium campestre*) [*Xanthomonas campestris*] in the Seychelles during 1945 was very light, though in 1944 it had been heavy. The remedial measures taken (partial sterilization of the soil by burning or by the application of formaldehyde, and seed disinfection) appear to have been highly successful.

SEVERIN (H. H. P.) & DRAKE (R. M.). **Sugar-Beet mosaic.**—*Hilgardia*, 18, 13, pp. 483–521, 8 pl., 1 fig., 1948.

After reviewing earlier investigations into mosaic disease of sugar beet [*R.A.M.*, 28, p. 265] with particular reference to its common names and symptoms, the question of multiple viruses, the classification of the virus, geographical distribution, economic importance, transmission, overwintering, and host range, the authors present a full account of their own studies on the subject in California. The disease is nowhere important in commercial root fields but is serious on sugar and garden beets grown for seed, considerable reductions in yield resulting. Mangel, garden beet, Swiss chard (*Beta vulgaris* var. *cicla*), and spinach are naturally infected in California; *B. maritima*, *Kochia scoparia* var. *trichophila*, New Zealand spinach (*Tetragonia expansa*), and tobacco (Havana type and Primus) were experimentally infected.

The sequence of symptoms on these hosts, and even on a single plant, varied widely. For instance, on sugar beet after preliminary symptoms of a few minute yellow or pale green flecks on the youngest leaves or occasionally irregular, chlorotic areas, apparent only when the leaves are held up to the light, veinlet clearing generally spreads over the whole leaf in twenty-four hours. Widening and merging of chlorotic areas along the cleared veinlets mark the beginning of an irregular blotching type of chlorosis of leaves in adjacent whorls. The mosaic pattern may

consist of green blotches in a faintly chlorotic leaf or of well-defined chlorotic blotches in the green portion. Young leaves often crinkle along the margin, and large, deep green, blister-like protuberances may arise on the upper surface, though other leaves from the same plant may not show them. Three weeks after inoculation, the blotching type of chlorosis was often replaced, especially on the intermediate leaves, by variously-sized chlorotic rings with green centres, or by numerous, scattered, chlorotic dots, or a mixture of both. Some leaves displayed only a few scattered dots, or small, chlorotic areas which enlarged very slowly, if at all. In another type, a chlorotic band extended the length of the midrib and partly along some of the lateral veins. Necrosis of the midrib, veins, and petioles may occur on plants in an advanced stage of the disease. The heart leaves of affected seedlings are generally dwarfed, but the tendency is for them to improve. The inoculation period in sugar beets averaged about eight days in the greenhouse and 25 days outdoors.

On mangels the leaf symptoms were essentially the same as on sugar beet. The incubation period in the greenhouse was six to nine days.

In garden beets cleared veinlets developed. Stunting, crinkling, small blister-like elevations, and malformations of the youngest leaves were sometimes present, but as growth continued normal-shaped leaves were produced and dwarfing was largely overcome. Interveinal chlorosis sometimes appeared on the intermediate leaves, with a predominance of chlorotic dots and irregular areas outlined with red on the outer leaves, which began to develop 10 days after inoculation. Sometimes wide, outer red rings developed, each with an inner chlorotic ring enclosing a pale red centre. The rings frequently coalesced. Later, a necrotic centre appeared, which enlarged and sometimes fell out. In the greenhouse, the incubation period ranged from six to eight days in seven varieties of garden beets tested.

In the glasshouse the incubation period for three varieties of Swiss chard ranged from six to 19 days.

When infective *Myzus persicae* were fed on leaves of Havana type and Primus tobacco the former developed circular, chlorotic areas, sometimes with a pin-point necrotic centre (probably the feeding puncture), while the latter developed concentric rings.

The thermal inactivation point of the virus was 60° C. in ten-minute exposures [ibid., 12, p. 674]. Freezing the expressed juice at —18° resulted in a decrease in the number of infections, reaching zero at the end of five months. Tolerance of dilution of extracted juice was 1:5,000; infectivity was lost after ageing for six days *in vitro* at room temperature.

The virus was transmitted by the following aphid species which multiplied on sugar beets: *Aphis middletonii*, *A. rumicis*, *Macrosiphum pisi*, and *Myzus* [*Macrosiphum*] *persicae*, and by the following reared on other hosts: *A. apigraveolens*, *A. apii*, *A. ferrugineastriata*, *A. gossypii*, *A. medicaginis*, *A. pomi*, *Brevicoryne brassicae*, *Cavariella capreae*, *Myzus solani*, *Rhopalosiphum conii*, and *R. pseudobrassicae*. Infections obtained with *A. middletonii*, *Macrosiphum pisi*, and *Myzus persicae*, reared on mosaic beets were 20, 60, and 56 per cent., respectively, as compared with 96 per cent. by mechanical inoculation using virus extract from the plants on which they were reared; the corresponding figures for the ten aphid species reared on other hosts were 8 to 76 per cent., as against 88 to 100 per cent. by mechanical inoculation.

Short feeding time of winged aphides may be of significance in natural spread of the disease, as lots of one, two, three, four, and five *Myzus persicae* gave infections averaging 0, 25, 25, 40, and 45 per cent., respectively, after feeding for five minutes each on mosaic and healthy beets. Under greenhouse conditions, virus retention by lots of 20 infective aphides ranged from one to three hours. On one occasion, aphides recovered the virus from infected sugar beet one day before symptoms

appeared, in another instance on the same day after the first symptom appeared, and in others one to two days after the appearance of the first symptom.

Multiple viruses in a sugar beet were separated by previously non-infective *Mysus persicae*, which recovered the sugar beet mosaic virus and by previously non-infective *Eutettix tenellus*, which recovered the beet curly top virus.

SYLVESTER (E. S.). **Transmission of Sugar Beet yellow-net virus by the green Peach aphid.**—*Phytopathology*, 39, 2, pp. 117–132, 1949.

The primary vector of the yellow-net virus disease affecting sugar beets in California appears to be *Myzus persicae* [*R.A.M.*, 28, p. 105], though experimental evidence was obtained that *Aphis rumicis*, *M. pseudosolani* [*Macrosiphum solani*] and *Macrosiphum solanifolii* can also act as vectors. The acquisition threshold (defined as the minimum time necessary for a vector to feed on a disease source in order to acquire an infective charge of virus) was found to occur at five minutes, while the inoculation threshold (the minimum time required for an infective vector to feed on a healthy plant in order effectively to inoculate it with a given virus [corresponding to Storey's 'threshold' period: ibid., 17, p. 387]) is about 15 minutes after the commencement of feeding. Evidently, therefore, penetration of the mesophyll suffices for the acquisition of the virus, but the phloem is the essential tissue involved in inoculation. There was no indication of a definite latent period.

Myzus persicae retained the virus for 11 days, i.e., the duration of its life under experimental conditions. Tests on the effect of multiple feeding punctures indicated that the saliva introduced into the plant to form the salivary sheath, or the saliva ejected shortly thereafter, is the vehicle for virus transmission. Virus contamination of the saliva appears to be discontinuous rather than continuous. The experimental results showed that an insect may be spasmodically active in the production of infections, implying the ejection at times of uncontaminated saliva. There appears to be no phasic or cyclic occurrence of the active and passive states of infectivity, but the status, failing a better explanation, would seem to be determined by individual 'potency' (Storey's term [loc. cit.]).

The vector efficiency of a vector group consisting of ten apterae is approximately 75 per cent. as compared with 25 per cent. for that of a single aptera. The yellow-net virus is transmissible by first instar nymphs, pupae, and alate and apterous viviparae, and is retained through a moult.

KERLING (L. C. P.). **Aantasting van Erwten door Mycosphaerella pinodes (Berk. et Blox.) Stone.** [Infection of Peas by *Mycosphaerella pinodes* (Berk. & Blox.) Stone.]—*Tijdschr. PlZiekt.*, 55, 2, pp. 41–68, 8 figs., 1 diag., 4 graphs, 1949. [English summary.]

The author's studies on the effects of *Mycosphaerella pinodes* on the pea plant and on the life-cycle of the fungus under the environmental conditions prevailing in Holland [*R.A.M.*, 25, p. 286] were directed towards an understanding of its part in relation to the many other pathogens of the crop, which is not yet clear.

The results of inoculation experiments showed necrosis of the epicotyl to be relatively innocuous, causing only slight dwarfing. However, the necrotic spots developing from stem and leaf inoculations are often responsible for the premature death of the plant. Infection was most severe on plants inoculated at the stem base and kept in closed glass tubes at high humidity, the necrotic lesions rapidly expanding and coalescing so that the epicotyl turns dark brown. Pycnidia were never detected on the epicotyl.

Microscopic examination revealed the entry of the mycelium into the tissues through ruptures in the cuticle. Under humid conditions the hyphae also enter through the stomata. They penetrate the outer tangential walls of the epidermal cells near the corners and may fill up these cells with a dense mass, 7 to 9 μ in

diameter, bearing chlamydospores. The hyphae then perforate the inner cell walls and invade the intercellular spaces, where they follow the borders of two adjacent cells but without dissolving the middle lamella, so that the cells remain in contact. A yellow substance, probably a pectin derivative, soluble in hot potassium hydroxide and other solvents, is produced in the intercellular spaces.

Two or three weeks after inoculation under any of the experimental conditions selected, *M. pinodes* could no longer be isolated from the cortex of the epicotyl. The hyphae, covered by the yellow-brown substance in the intercellular spaces, lose their protoplasmic contents and die. In the stems and leaves the pathogen is more tenacious. Secondary fungi, e.g., *Verticillium* sp., *Botrytis cinerea*, and *Fusarium* spp., gain ingress to the plants through the lesions at the stem base, but the extent of the damage they cause is not yet known.

When the plants bearing ripe pods begin to die off, the surviving hyphae, 3 to 7 μ in diameter, penetrate the lumina through the pits in the cell walls. A dense hyphal stratum extends in a tangential direction beneath the collenchyma layer, separating the epidermis and outer layers from the inner cortical layers. Perithecia are initiated after two days of mycelial proliferation. At this stage the fungus behaves as a true saprophyte. The perithecia were cultured *in vitro* on the frozen stems of young sterile pea plants and on the stems of sterile plants after treatment with ether. Parts of the stems of these plants were placed near the edge of oatmeal agar cultures of *M. pinodes* in Petri dishes. The mycelium invaded the cortex and an epidermal stroma was formed, giving rise to numerous perithecia, which ripened in about 15 days at 15° C.

Under moist conditions the ascospores reach maturity in three weeks at 16° and in five at 2·4°; during the rigorous winter of 1947 the process occupied a period of four months. During the autumn ascospores from pea debris may infect 'volunteer' plants, and when the latter are killed by the frost perithecia develop on them. Should a severe winter arrest the maturation of the ascospores they ripen in April and May, when young plants are available for infection. After a mild winter, however, the ascospores are discharged too early to attack the new crop. In the spring of 1947 a correlation was established between rainfall, ascospore ejection, and increase in the number of leaf spots caused by wind-borne ascospores. Infection spread in the direction of the prevailing winds, the severity of the attack diminishing in proportion to the distance from the contaminated pea straw. A fortnight after the occurrence of infection pycnidia developed in the spots and the water-borne pycnospores were responsible for a further rise in the disease rate. The anticipated epidemic, however, was held in check by drought. In the autumn of 1948 a similar correlation was observed between precipitation and disease intensity, but at this time the development of the pathogen ceased with a fall in temperature.

Previous studies on host resistance [loc. cit.; ibid., 27, p. 270] showed that field and even glasshouse conditions are too unstable to admit of comparisons between the behaviour of different varieties, and the following laboratory technique was therefore devised for varietal reaction tests. The epicotyls of five-day-old plants were exposed to a spore suspension of the pathogen, which was replaced by water after two days; the plants were kept in closed glass jars in an incubator at 24°. After the first day of incubation the epicotyls of all the experimental varieties showed necrotic spots. There was, however, a slight difference in the time required for their expansion, which proceeded more slowly in Stijfstro than in Unica or Alaska. The enlargement of the spots ceased after about a week's incubation, but the weakening of the cortical cells by the very humid conditions prevailing in the jars led to their penetration by *M. pinodes* and the consequent death of the plants. Here again some varieties succumbed more rapidly than others. Thus, the expansion rate of the spots on the epicotyl and the intensity of infection may be used as criteria of varietal susceptibility.

Seed disinfection may be practised as an adjunct to field sanitation for the control of the foot rot due to *M. pinodes*. However, the spores or mycelium are not always carried on the seed coat, but may be harboured by the cotyledons of externally sound peas. Probably the pathogen can enter the seed from diseased pods by way of the funicle, and seed should therefore be procured exclusively from plants with healthy pods.

Bridgmon (G. H.) & Starr (G. H.). **Studies on the white mold of Beans caused by Sclerotinia sclerotiorum.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, p. 43, 1948.

The results of preliminary trials in Wyoming on the control of bean [*Phaseolus vulgaris*] white mould (*Sclerotinia sclerotiorum*) [*R.A.M.*, 25, p. 592] by soil treatment with calcium cyanamide at 900 lb. per acre were not encouraging. The sclerotia of the fungus were more abundant on plants grown on heavy soil than on those on sandy ground. Ascospores were produced in large numbers in the north of the State during August, 1947. Of the 10° intervals between 45° and 85° F. tested, 65° proved to be the most favourable to the growth of the fungus and sclerotial development. The sclerotia were destroyed by passage through the alimentary tract of cows and by trampling by livestock. Individual plants of a number of 'snap' and commercial varieties were more resistant than others in varietal reaction tests.

Stubbs (L. L.). **A new virus disease of Carrots : its transmission, host range, and control.**—*Aust. J. Sci.*, 1, 3, pp. 303–332, 4 pl., 1948.

This is a full report of studies on a destructive virus disease of carrots [*R.A.M.*, 24, p. 134] affecting crops throughout Victoria, and also in New South Wales, South Australia, Western Australia, and Tasmania.

The insect vector *Cavariella aegopodii* caused 100 per cent. infection, the incubation period in carrot being about 17 days. The virus has also been transmitted by grafting, but not by mechanical inoculation or through seed. Carrot (both cultivated and wild) is the only natural host. *Apium ammi*, *A. australe*, *Conium maculatum*, dill, and coriander were infected experimentally, while celery, parsley, parsnip, caraway, and fennel are apparently immune. All carrot varieties tested were susceptible to infection. In one experiment the vector *C. aegopodii* remained infective for 18 days after 48 hours infection feed. There is no evidence indicating a latent period in the vector.

Infected roots when transplanted for seed production suffered a high mortality; in those which survived, seed production was greatly reduced. Inoculation with various fungi associated with root decay (*Alternaria radicina* [*Stemphylium radicinum*: see below, p. 440] and species of *Sclerotium*, *Fusarium*, and *Verticillium*), caused the same rate of rotting in virus-infected and healthy carrot roots. The biological breakdown of roots in carrot seed crops is considered a secondary development and is a form of necrotic collapse resulting from virus infection.

Delayed sowing of susceptible varieties until early summer controlled the vector and the disease. In spraying tests with spring sown Chantenay carrots weekly applications of DDT almost completely eliminated the vector, significantly reduced the incidence of the disease, and increased sixfold the yield of marketable roots. On plots infested with aphids and in which 100 per cent. virus infection occurred, the yields of marketable roots from the tolerant Victorian strain, Champion Intermediate, Imperator X, and the susceptible Chantenay were 30·7, 17·2, 14·4, and 8·2 lb., respectively.

Selderijziekten. [Celery diseases.]—*Vlugbl.* (*Vlugschr.*) *pl.-ziekt. Dienst Wageningen*, 9, 4 pp., 2 figs., 1948.

The symptoms of three diseases affecting celery in Holland are briefly described

in popular terms and directions given for their control. Measures to be taken against leaf spot (*Septoria apii*) comprise seed disinfection; crop rotation, allowing a lapse of two years or preferably longer between each planting of celery; and, if necessary, spraying with 1 per cent. Bordeaux mixture or other copper-containing preparation, the treatment with Bordeaux to be discontinued a month before harvesting leaf and blanched celery, while copper oxide may be used up to 16 days beforehand.

Seed disinfection as prescribed above is also applicable to the root rot caused by *Phoma apiicola*. The elimination of the pathogen from the soil necessitates a quadrennial rotation.

Soft rot (*Bacterium carotovorum*) [*Erwinia carotovora*: *R.A.M.*, 24, p. 304] has not proved amenable to any of the usual control measures. The prompt eradication of all diseased plants is essential to prevent the spread of infection.

Behr (L.). **Histologische Untersuchungen an krätzekranken Gurken (Cucumis sativus L.) unter besonderer Berücksichtigung des Krankheitsverlaufes der Krätze (Cladosporium cucumerinum Ell. et Arth.) an Früchten.** [Histological studies on gummosis-diseased Cucumbers (*Cucumis sativus* L.), with special reference to the course of gummosis disease (*Cladosporium cucumerinum* Ell. & Arth.) on the fruits.]—*Phytopath. Z.*, 15, 1, pp. 92–123, 11 figs., 1948.

This is an amplified account of the writer's studies at Aschersleben, Germany, on the histology of cucumber gummosis (*Cladosporium cucumerinum*), a preliminary note on which has already appeared [*R.A.M.*, 27, p. 309].

Prasad (N.). **Variability of the Cucurbit root-rot fungus, Fusarium (Hypomyces) solani f. cucurbitae.**—*Phytopathology*, 39, 2, pp. 133–141, 2 figs., 1949.

Thirty-three strains of *Hypomyces solani* f. *cucurbitae* [*R.A.M.*, 27, p. 307; 28, p. 346] were found to differ among themselves in culture type, growth rate, pigmentation, and macroconidial dimensions on potato dextrose agar. Six strains were characterized by a slow, button type of growth, while pigmentation ranged from pure white to yellow, green, and bluish-green. The minimum conidial length was 20·2 and the maximum 61·7 μ.

Inoculation of the host (Black Zucchini squash seedlings) with a single germinated spore proved to be a satisfactory method for the comparison of strains in respect of pathogenicity. They fell into six groups, namely, very virulent (comprising three isolates which killed the plants in ten days); virulent (18 in 12 to 15 days); fairly virulent (one, causing lesion development in ten days); weak (three, inducing lesions in 15 days); very weak (two, only very slight lesions after 20 days); and non-parasitic (one, no lesions of any kind as long as 30 days after inoculation). The two most rapidly growing strains (6·2 and 6·3 mm. daily) were also the most highly pathogenic, but on the other hand, a very slow-growing isolate caused more damage than two that developed more quickly. Thus, there was no consistent correlation between growth rate and pathogenicity. The growth rate and pathogenicity of the very slow-growing strain were enhanced by the addition to Hoagland's solution of biotin at a dosage of 10×10^{-6} per l.

Martin (J. A.). **Bacterial spot resistance in Peppers.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 336–340, 2 figs., 1948.

In the spring of 1946 eleven varieties of [chilli] peppers were inoculated with *Xanthomonas vesicatoria* [*R.A.M.*, 19, p. 451] and grown under relatively low and high humidity conditions in the greenhouse at Clemson Agricultural College, South Carolina. Santanka (4a–2-1) and Cayenne (4566) were found to be highly resistant to the organism, Cayenne (4530 P2) and (4512 P2) moderately so, Cayenne (4537 P1) and (4509 P4) were moderately susceptible, while the commercial varieties Truhard Pimento and Louisiana Sports were highly susceptible.

Baillot D'Estivaux (L.). **Le cuprosulfite de cuivre, anticryptogamique permanent pour la Vigne.** [Copper cuprosulphite, a permanent fungicide for Vines.]—*Progr. agric. vitic.*, 130, 44, pp. 230–233, 1948.

This information has already appeared in two other sources [*R.A.M.*, 27, p. 553; 28, p. 50].

Lafon (J.). **Compte rendu d'essais contre le mildiou.** [Report on experiments against mildew.]—*Vitic. Arboric., Paris*, 95, 1, pp. 15–16, 1 fig., 1949.

In comparative spraying tests against vine mildew [*Plasmopara viticola*: *R.A.M.*, 27, p. 408; 28, p. 376] carried out during 1948 in the vicinity of Cognac, 2 per cent. Bordeaux mixture was superior to any other material, but promising results were given by copper dinitro-salicylate (with a copper content one-quarter that of the Bordeaux mixture), copper formate, and copper cuprosulphite [see preceding abstract]. An American product based on 2,3-dichloro-1,4-naphthoquinone [phygon or U.S.R. 604: ibid., 25, p. 201] was distinctly effective, though it caused burning when used at a concentration of 1 per cent.

Laurens (R-P.). **Mildiou 1948.** [Mildew in 1948.]—*Progr. agric. vitic.*, 130, 44, pp. 228–230, 1948.

From fungicidal treatments against vine [downy] mildew [*Plasmopara viticola*: see preceding abstract] and the severity of the subsequent attacks in France in 1948, it was concluded that for efficient control the spray must reach the lower surfaces of the leaves and the bunches concealed by the foliage. The first spray applications, made when the branches are still erect, are quite effective but later, during a severe attack, when the branches are spread out, sprays applied in a fine rain or from the side are completely ineffective.

Rosella (E.). **A propos du court-noué à virus de la Vigne au Maroc.** [On Vine court-noué of virus origin in Morocco.]—*Vitic. Arboric., Paris*, 95, 1, pp. 17–18, 1949.

In Morocco and in north Africa generally, the virus form of vine court-noué disease [*R.A.M.*, 28, p. 318] is less common than in metropolitan France, court-noué symptoms in north Africa being seldom severe and usually due to soil exhaustion or attack by *Phylloxera* [*vastatrix* f. *radicicola*] or eelworms. If the site of an old vineyard which has been affected in places is immediately replanted, the disease generally becomes even more prevalent, at any rate when the virus form is present. It is difficult to understand why this should be so if it is true that the disease is transmitted by an insect.

In view of the rarity of the disease in north Africa and the fact that vines are imported almost without inspection, it would seem that the disease cures itself in this area. Either the virus is inhibited or attenuated by heat or some form of radiation, or no virus is present and the disease is due to some soil factor. A case is quoted in which very severely affected vines after being grafted on to Seibel 54–55 recovered and were still in excellent health six years later.

Williams (W. O.) & Hewitt (W. B.). **Control of Grape root-rot in solution culture.** —*Proc. Amer. Soc. hort. Sci.*, 52, pp. 279–282, 1948.

During nutrition studies at the University of California, grape vines growing in solution culture became severely infected with a root rot, the causal organism of which was tentatively identified by J. T. Middleton as *Pythium oligandrum* [*R.A.M.*, 26, p. 132]. Vine roots developed and rotted most rapidly at 95° F.; the severity of the disease appeared to decrease with decreasing temperatures, which, however, gave unsatisfactory growth.

To control the pathogen weekly applications of fermate at $2\frac{1}{2}$ and 5 p.p.m.

resulted in very good growth after 12 weeks. Higher concentrations were even more effective, but proved toxic to the vine.

Lott (W. L.). **Magnesium injection in Muscadine Grape Vines.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 283–288, 1 fig., 1948.

Scuppernong and James muscadine grape vines, growing in magnesium deficient soil at the Coastal Plain Experiment Station, Willard, North Carolina, and exhibiting chlorosis, were injected with a magnesium sulphate solution (100 gm. per l.) in quantities ranging from 9 to 59 gm. per vine. At harvest time the disorder was completely corrected by injections of 43 to 59 gm. per vine; 24 gm. gave only moderate improvement. Leaf samples collected at three dates showed definite increases in magnesium content for injected vines. Soil treatments with 2·5 and 5 lb. magnesium sulphate per vine were ineffective during the first season of application.

Bald (J. G.). **Additional methods for fixing and staining viruses in infected plant tissues.**—*Amer. J. Bot.*, 36, 4, pp. 335–342, 6 figs., 1949.

Tests at the University of California, Los Angeles, showed that fixatives which would preserve viruses in the cells of infected plants and prepare them to accept appropriate strains were Lugol's iodine–potassium iodide, the same in 50 per cent. alcohol (either of which may be combined with 5 per cent. formalin or with chromic acid), and a third series, the effect of which depends on the action of concentrated acetic acid and cerium nitrate on the virus. Some of these fixatives preserve the structure of plastids, mitochondria, and other cell constituents that may be important in virus multiplication. In addition to Giemsa stain, iron-alum haematoxylin, various acid fuchsin combinations [*R.A.M.*, 28, p. 135], Flemming's triple stain, Nile blue sulphate, and trypan blue were used in the trials. Inclusion bodies and more disperse material, presumed to be virus, were stained uniformly. Tissues containing tobacco mosaic virus, potato virus X, a mixture of each, and the viruses of tomato spotted wilt, squash mosaic [? cucurbit mosaic], potato leaf roll, and Pierce's disease in lucerne [lucerne dwarf] all gave similar staining reactions.

Sheffield (F[rances] M. L.). **Preliminary studies in the electron microscope of some plant virus inclusion bodies.**—Reprinted from *J.R. micr. Soc.*, 66, pp. 69–76, 1 pl., 1946. [Received October, 1948.]

Preliminary electron microscope studies of the contents of healthy and virus-infected plant cells obtained by microdissection are described [*R.A.M.*, 26, p. 174]. Electron micrograms of mixed sap and cytoplasm from healthy hair cells of tobacco, tomato, and *Solanum nodiflorum* consisted mainly of unidentified material ranging in particle size from about 20 μ to beyond the limits of resolution of the electron microscope. In the amorphous and crystalline inclusions found in plants infected with strains of tobacco mosaic virus, rods of about 15 mμ diameter and of various lengths were observed; preparations from tobacco, tomato, and *S. nodiflorum* contained similar bodies. Virus in smaller quantities was also found in the cytoplasm and sap from mosaic-infected cells. In the amorphous inclusions of severe etch [tobacco etch: ibid., 20, p. 500; 25, p. 492; 26, p. 32] there were many crystals of various shapes too small to be seen in an ordinary microscope. There is some evidence that the particles of this virus are rod-shaped.

Esau (Katherine). **Some anatomical aspects of plant virus disease problems. II.**—*Bot. Rev.*, 14, 7, pp. 413–449, 1948.

This review [cf. *R.A.M.*, 18, p. 198] compiles the literature of the past ten years on the anatomical effects of plant viruses and correlates the old and new information on the nature of the internal symptoms and their bearing on plant tissue relations of viruses.

Report of the Science Service, Dominion Department of Agriculture, for the year ended March 31st, 1947.—105 pp., 1948.

The following are among the items of interest in the Plant Pathology section (pp. 39–68) of this Canadian report [cf. *R.A.M.*, 26, p. 329]. Charcoal rot (*Macrophomina phaseoli*) [ibid., 25, p. 56] was abundant on navy beans [*Phaseolus vulgaris*] on dry, sandy soil in south-western Ontario. Evidence was obtained showing that *Ascochyta pisi* comprises at least three different pathogenic strains. Field experiments indicated that as the percentage of seed infected with *A. pisi* increases, emergence and yield diminish. In a test with potato top killers to prevent tuber infection by blight (*Phytophthora infestans*), dow G-502 (dowspray 66 improved) [cf. ibid., 28, p. 140] gave the most rapid kill, but dow G-506, sinox, and sodium arsenite also completely killed the plants in a reasonable time. All the chemicals used, particularly sinox, caused slightly more vascular necrosis in the tubers than was present in the controls.

When Katahdin and Green Mountain potatoes were stored at 32°, 36°, and 39° F. low temperature breakdown appeared in Katahdin after 59 days at 32° and was severe after 129 days; only a trace appeared in Green Mountain in the same period at the same temperature. No breakdown occurred in either variety stored at 36° or 39°.

Dutch elm disease [*Ceratostomella ulmi*: ibid., 27, p. 555] is still confined to Quebec; some extension of the affected area to the north-east, west, and south-west took place. Owing to the high incidence of infection in the central part of the diseased area, the removal of diseased trees there was stopped and control was confined to the outer districts.

Studies on poplar heartwood decay (*Fomes igniarius*) [ibid., 25, p. 238; 26, p. 429] showed that the percentage volume of decay is unaffected by site within the range of local conditions. The absolute volume of high quality wood, however, is certainly related to such conditions. The disease does not cause serious losses (on a volume basis) in stands under 70 years old. The fungus is able to attack living trees through wounds not only in the heartwood but also entirely within the sapwood region. Girdling is a more effective method than felling for the disposal of badly diseased trees.

Further investigations on magnesium deficiency in potatoes [ibid., 24, p. 492; 25, pp. 98, 523] showed that the most severely affected fields had a pH value of 4·6 to 5. Dolomitic limestone applications satisfactorily corrected the deficiency, while magnesium sulphate spray proved moderately beneficial and increased the yields. Magnesium oxide at 20 lb. per acre was fairly effective and at 80 lb. highly satisfactory.

At Kentville, Nova Scotia, apple mosaic has increased in the last seven years [ibid., 25, p. 304] from 24 to 37 per cent. in an orchard under normal orchard practice.

At Fredericton, New Brunswick, analysis of the viruses present in Green Mountain potato stocks from six provinces disclosed that most sources of this variety, including Foundation and Certified stocks, have acquired a virulent strain of the latent mosaic virus [potato virus X: ibid., 17, p. 126]. There was also some evidence that stocks with the virulent strain are more susceptible to net necrosis when infected with leaf roll.

Two potato seedlings have shown no sign of leaf roll in four years' testing and appear to have a high degree of resistance under field conditions. Approximately 46 per cent. of the seedlings of *Solanum demissum* × *S. tuberosum* hybrids were immune from or highly resistant to vine infection by *P. infestans*; 124 of these, with the most desirable commercial qualities, had blight-immune tubers. About 12 per cent. of 1,169 seedlings from 43 crosses produced tubers highly resistant to scab [*Actinomyces scabies*]. At St. Catherines, Ontario, scab-free potato tubers

grown in pots of scab-infested soil, kept fallow, and those which had previously grown two crops of potatoes produced severely scabbed tubers; those in the pots in which two crops of soy-beans had been grown, the second crop being incorporated in the soil, were the cleanest and those following rye, the next best. The reduction in infection following soy-bean was found to be correlated with reduction in pH and increased nitrate and potassium levels in the soil.

In field fertilizer experiments on the incidence of tobacco brown root rot [ibid., 26, p. 47; 28, p. 90] the yield of the susceptible Halley's Special Burley grown in brown root rot soil was increased four times by the optimum application of nitrogen fertilizer, whereas the yield of the resistant Green Briar was only doubled. Yield of susceptible varieties was very low in brown root rot soil where the fertilizer contained no nitrogen. Ammonium and sodium nitrates were the best nitrogen sources.

The formerly rare race 8 of oat stem [black] rust [*Puccinia graminis*: ibid., 26, p. 385; 27, p. 553] has for several years increased in prevalence, constituting in 1946 about 30 per cent. of the oat black rust present in Manitoba and Ontario. As this race is able to infect the newer Canadian and American oat varieties, it is already a menace to their production. In view of this, the release of Garry oats, resistant to race 8 and all other known races of black rust, all races of crown rust [*P. coronata*] found in Canada, and to both oat smuts [*Ustilago avenae* and *U. kolleri*], is highly opportune.

Investigations on the resistance of cereal varieties to root rot pathogens, mainly *Helminthosporium sativum* [ibid., 27, p. 316], were continued at Saskatoon, Saskatchewan. Thatcher [wheat] showed evidence of heterogeneity for resistance, and selection of lines for this character may be possible.

In studies on carrot black rot (*Alternaria radicina*) [*Stemphylium radicinum*: ibid., 24, p. 492; 28, pp. 159, 435] at Summerland, B.C., the fungus caused no rot when inoculated into beet, mangel, parsnip, potato, onion, and radish. Mature carrots were infected without wounding and carrot seedlings through tops and roots. Greenhouse experiments at St. Catharines, Ontario, indicated that seed treatment with 1 per cent. ceresan may reduce infection by the seedling blight stage of black pod blotch of radish (*A. raphani*) [ibid., 27, p. 344] by 25 to 40 per cent. After treatment the seed should be sown early enough to allow harvesting of the seed crop before the cool wet weather of late summer. There appear to be numerous strains of *A. raphani*. At Summerland the most effective control of *A. raphani* on radish seed was again obtained by soaking in water at 50° C. for 10 to 40 minutes, while the best chemical control was given by semesan jr and puratized N5 E.

Annual Report of the Science Service, Dominion Department of Agriculture, for the year ended March 31st, 1948.—105 pp., 1949.

The following items of interest occur in the Plant Pathology section (pp. 35–68) of this Canadian Report [cf. preceding abstract]. An examination of the Sudbury district for symptoms of injury to trees and shrubs by sulphur dioxide fumes from smelting works [cf. ibid., 24, p. 272] was again made in co-operation with the Ontario Departments of Lands and Forests and of Mines. Acute injury to several of the most sensitive broad-leaved species was noted about 40 miles north-east of Copper Cliff, and at 20 miles north-east severe injury was apparent on a variety of plants, including young conifers. In other directions no acute injury was seen at any great distance.

In 1945, 1946, and 1947, the numbers of elms found to be infected by *Ceratostomella ulmi* [loc. cit.] were respectively, 1,321, 2,100, and 720, all in Quebec. In 1947, some extension occurred in the western part of the infected area. Five diseased trees were found for the first time in Argenteuil county, the nearest about three

miles from the Ontario boundary, and one in Laprairie county. Considerable intensification was noted in Lothiniere, Richmond, and Megantic counties.

The collection of cultures of wood-destroying fungi [cf. ibid., 28, p. 201] now contains 1,473 named cultures, representing 416 species in 83 genera. It was demonstrated by pairings that the cultures isolated from typical decays included haploid strains of *Fomes pinicola*, *Polyporus pubescens*, and *P.* [*Polystictus*] *abietinus* [ibid., 25, p. 146]. A comparative study of *Peniophora allescheri*, *P. heterocystidia*, *P. mutata*, and *P. populnea*, which have similar morphological characters, showed that all displayed bipolar interfertility. Pairings showed each species to be intrafertile, but the different species were intersterile. It appears, therefore, that four distinct species should be recognized. The same technique showed *Trametes heteromorpha* and *T. variiformis* to be intrafertile but intersterile, thus confirming the separation made on the basis of the morphological characters of the fruit bodies.

An examination of a wind-thrown second-growth area of Douglas fir [*Pseudotsuga taxifolia*] showed that almost all the infection was due to *Poria weirii* [ibid., 26, p. 432]. A preliminary survey made to determine the cause of death of many Douglas fir seedlings in the British Columbia Forest Service nurseries showed *Fusarium oxysporum* f. *pini* [ibid., 24, p. 483] to be responsible. In 100 days, 49·9 per cent. of all the seedlings in one nursery were killed by the disease. The use of hardwood sawdust on the cover soil or worked into the soil gave promising control.

Storage dry rot of potatoes (*Fusarium sambucinum* f. 6) [ibid., 24, p. 384] is an important problem in Prince Edward Island. It is soil-borne and enters the tubers through wounds. Irish Cobbler and Katahdin are relatively immune, while Green Mountain and Sebago are highly susceptible. Evidence was obtained of the existence of biologic strains of great virulence.

The development of apple scab [*Venturia inaequalis*: ibid., 27, p. 370; 28, p. 68] in Nova Scotia was favoured by the weather conditions which prevailed in the spring of 1947. During the early season there were several severe infection periods and control was rendered more difficult by the early development of the conidial state on the foliage before full bloom. Sulphurs in paste form again gave better control than those in the dry wettable form. Phygon was superior to the sulphurs, exercising an eradicant effect on the young lesions. Mercurated lead arsenate gave excellent control in spring and summer, but failed to prevent late-season infection. Data on fruit blemishes on apple fertilizer plots at Kentville, Nova Scotia, indicated that plots receiving potash in addition to nitrogen or to nitrogen and acid phosphate were more susceptible to scab than those not given potash. At Fredericton, New Brunswick, scab control was satisfactory with phygon and glyoxalidine, very good with mulsoid sulphur, karbam, dry lime-sulphur, and mike sulphur, and fair to good with goodrite and fermate sprays. At St. Catharine's phygon was outstanding in scab control but caused russeting, decoloration, and staining of the fruit. Magnetic sulphur paste adhered well and ranked first among all the sulphurs in scab control. Fermate was effective, particularly in cover sprays. Mercurated arsenate of lead was the least effective material tested. In the Creston area, British Columbia, where scab was severe, perfect control was obtained with a four-spray schedule, using lime-sulphur 1–60 or fermate 1 lb. plus wettable sulphur 3 lb. per 100 gals. water.

A virus disease similar to necrotic peach spot [cf. ibid., 26, p. 203] was found in a more or less latent form in Ontario in Italian prune, Shiro plum, Lambert sweet cherry, and Montmorency sour cherry. In peach, the disease causes little or no die-back during the first year of infection, but produces recurrent chlorotic patterns and necrotic spotting on the leaves in June and July; the commoner necrotic ring spot causes moderate to severe die-back and induces chlorotic patterns and necrotic spotting only in the middle stages of infection.

It was ascertained that the virus causing tatter leaf of sweet cherries [ibid., 25, p. 266] did not survive in buds subjected to a temperature of 50° C. for 20 minutes; necrotic ring spot [ibid., 28, pp. 20, 339] and possibly cherry yellows [loc. cit.] survived 24 but not 28 minutes, and prune dwarf [loc. cit.] 20 but not 24 minutes. In a survey of 26 sweet cherry orchards in the Niagara district, tatter leaf was found in all but two. The percentage of trees infected ranged from 0·6 to 41·3 (average, 10·2) in the affected blocks. A survey of 32 sour cherry orchards in the same district and in Halton county showed cherry yellows to be present in every orchard, infection ranging from 3·9 to 79·6 (average, 25·7) per cent. In orchards previously surveyed, increases of from 2·6 to 21·9 per cent. infection were found. A small proportion of trees, known to have been previously infected with cherry yellows or a yellows-like disease, showed no symptoms in 1947. The known minimum incidence of necrotic ring spot ranged from 0 to 73·7 per cent. in the several orchards surveyed, but in most orchards few trees showed first-year infection, so that probably most orchards are very largely affected. Peach wart [ibid., 27, p. 355] and peach ring spot were recorded in the Okanagan Valley for the first time in 1947.

Lucerne rust (*Uromyces medicaginis*) [*U. striatus*: ibid., 27, p. 554] was found for the first time in Saskatchewan.

FOISTER (C. E.). **Report of the Annual Conference of the Cryptogamic Section, 1947.** —*Trans. bot. Soc. Edinb.*, 35, 1, pp. 103–107, 1948.

A list is given of cryptogams collected by the Cryptogamic Section of the Botanical Society of Edinburgh during forays made in September, 1947, in the Dunkeld and Pitlochry districts [cf. *R.A.M.*, 27, p. 505]. The records include *Cronartium ribicola* on black currant and *Keithia thujina* on *Thuja plicata*.

[The author requests readers to note that in this list the records of *Peronospora parasitica* on plants other than *Capsella bursa-pastoris* should be deleted.]

PALMER (A. E.). **Progress Report, Dominion Experimental Station, Lethbridge, Alberta, 1937–1946.**—91 pp., 12 pl., 5 graphs, 1 diag., 1949.

In experiments, strawberry chlorosis, a leaf yellowing caused by soil deficiency, was effectively eliminated by iron and ammonium sulphate solutions, either alone or in combination, sprayed on to the leaves. Ammoniated iron citrate was also very effective.

Fruit tree chlorosis, a form of 'yellows' caused by soil deficiency and aggravated by irrigation, has become widespread at the Experimental Station, Lethbridge, Alberta. Plums are the most susceptible fruits, particularly the Dropmore Blue variety, though in some orchards apples are affected almost as severely. In six years' tests, injections of moderate amounts of iron compounds into the trunks gave excellent results in nearly all cases. The best results were given by spraying with an iron solution.

In 1940, fireblight [*Erwinia amylovora*: *R.A.M.*, 27, p. 138] severely attacked most of the apple and crab apple trees in a new test orchard and spread to all the other station orchards, infection, it is thought, coming from infected nursery stock. Almost complete resistance over the period under review was shown by Haralson, Heyer No. 12, Hibernal, Manitoba Spy, Moscow Pear, Red Duchess, and Dr. Bill apples, Rescue, Trail, and Wapella apples by crab-apple hybrids, and Columbia, Dolgo, Florence, and Sylvia crab apples.

A co-operative investigation was carried out by the Lethbridge Station and the Dominion Laboratory of Plant Pathology, Edmonton, on breeding lucerne for resistance to bacterial wilt [*Corynebacterium insidiosum*: ibid., 26, pp. 8, 398; 27, p. 554; 28, p. 294] and crown rot [caused by a Basidiomycete: ibid., 27, p. 526]. A general survey showed that bacterial wilt was present in every irrigated lucerne

field three or more years old inspected in southern Alberta. Clear evidence was obtained that the disease builds up rapidly from the third year onwards. The serious resultant reduction in yield, common in the Lethbridge and Brooks areas, has necessitated the ploughing-up of stands in the fourth year.

In varietal trials in 1945 Viking, Ranger, Ladak, Autogamous, U.B.C., Ontario Variegated, and Grimm had, respectively, 42·34, 20·73, 37·27, 64·27, 86·66, 62·9, and 82·96 per cent. plants with bacterial wilt and 88·58, 86·6, 90·87, 96·85, 90·08, 96·99, and 98·34 per cent. with crown rot. Crown rot lesions were much less severe in Grimm and, particularly, U.B.C. than in the other varieties. In southern Alberta, however, Ranger, Viking, Hardistan, Meeker Baltic, Buffalo, Cossack, Grimm, and Ladak, gave good yields on reploughed wilt-infested land irrigated with infected water.

Foster (W. R.) & Macswan (I. C.). **Report of the Plant Pathology Branch.**—*Rep. B.C. Dep. Agric., 1948*, pp. R89–R95, 1949.

In this report [cf. *R.A.M.*, 27, p. 354] it is stated that potato blight [*Phytophthora infestans*: ibid., 27, p. 194] was more general and widespread than ever before, Calrose, Sebago, and Great Scott having fair, Epicure and Netted Gem slight resistance. The extremely beneficial effect of spraying with copper fungicides observed around Courtenay was partly due to increasing the strength of the proprietary products employed and making more frequent applications. Crops receiving an adequate application yielded 10 to 18 tons as compared with 2 to 3 tons [per acre] from the unsprayed crops. Potatoes grown in peat and muck soils had less tuber rot than those from clay. Twenty pounds of copper sulphate and 10 lb. salt in 100 gals. water proved an effective vine killer but the mixture is corrosive to metals. Most promising at present is a mechanical top killer, the 'Roto-beater', used for the first time this year. It is followed by an application to the soil of 20 lb. copper sulphate per 100 gals. water.

No bacterial ring rot [*Corynebacterium sepedonicum*: ibid., 27, pp. 537, 554] was found in any of the certified or foundation seed. A trace appeared on two farms and in three back gardens. Since ring rot was found in 23 out of 33 cars from Manitoba, a directive for 1948–49 allows a maximum of only three infected car-loads to be held in Victoria and Vancouver, all additional car-loads with infection will be returned to the place of origin unless arrangements can be made for exporting them. During recent years a considerable number of imported car-loads with ring rot have been directed to special markets where there is a minimum chance of spreading infection.

A survey revealed the presence of dwarf bunt [*Tilletia caries*: ibid., 27, p. 416] on winter wheat for the first time in Canada, infection being well-established in the Northern Okanagan at Armstrong and Enderby and also occurring on one farm on Vancouver Island. The incidence of bunt [*T. foetida*] in this, the most critical area in British Columbia, was greater in 1945, 1946, and 1947, but considerably less in 1948. The percentage of dwarf bunt ranged from a trace to about 5 per cent. and was found in the varieties Hussar, Ridit, Orfed, Jones' Fife, and Yogo, which were reduced from one-half to one-fourth their normal size. Excessive tillering was also present, especially in Hard Red winter varieties. Wheat seed contaminated with dwarf bunt spores will not produce a smutty crop. Dwarf bunt remains active in the soil for at least two seasons while common bunt contaminates the seed and soil on an annual basis.

Good progress has been made in reducing the amount of plum black knot [*Dibotryon morbosum*: ibid., 26, p. 440] in the Fraser Valley by reducing the main source of infective material on the reserves.

Powdery mildew [*Podosphaera leucotricha*] is the most serious foliage disease of apples in the southern and central areas of the Okanagan. The present control method, wettable sulphur or lime-sulphur at the pre-pink to pink and calyx stages,

gives some protection to the fruit, but is inadequate for the foliage. An investigation of this disease is being conducted at the Dominion Laboratory at Summerland.

A severe outbreak of onion mildew [*Peronospora destructor*: ibid., 26, p. 436] was aggravated by very wet weather. To prevent overwintering of the disease on the sets, heating at 40° to 43° C. for 24 hours or at 45° C. for eight hours is recommended. A fog-machine using fermate proved very effective during the year at Kelowna where weather conditions were very favourable for the disease.

The strawberry certification scheme prevented the introduction of red stele [*Phytophthora fragariae*] into non-infected land. The resistant variety, Temple, is recommended for limited trial until a more suitable variety is found.

The Washington variety of raspberry hitherto resistant to yellow rust [*Phragmidium rubi-idaei*: ibid., 25, p. 566] is now susceptible. A tentative control programme recommends (1) cutting out old canes flush with the ground and covering infected leaves with soil before growth takes place in the spring, and (2) a dormant spray of 1–10 lime sulphur or commercial, water-soluble dinitrocresol followed by fermate (2 lb. per 100 gals. water) when the blossom buds separate, before the earliest blossoms open, and after harvest.

Nattrass (R. M.). **Annual Report of the Senior Plant Pathologist, 1947.**—*Rep. Dep. Agric. Kenya, 1947*, pp. 139–141, 1949.

During the period under review [cf. *R.A.M.*, 27, p. 311], the number of physiologic forms of wheat stem [black] rust [*Puccinia graminis*] encountered and isolated remained at seven. The maintenance of healthy wheat plants in cages, and consequently the production of abundant rust, again presented great difficulties, partly owing to insect interference. Efforts are being made to surmount these obstacles, but complete success appears doubtful pending the establishment of some form of temperature and humidity control. In the meantime, a duplicate station has been set up under the Senior Plant Breeder's supervision at Njoro, where the climate is likely to prove more suitable for the maintenance of healthy wheat plants and rust cultures than that prevailing at the Scott Agricultural Laboratories. The predominant forms comprised in field samples of black rust were K3 and K7.

The multiplication and distribution of potatoes resistant to blight [*Phytophthora infestans*] were continued. The earlier introductions were grown by farmers under an agreement with the Department, providing for the free return to the latter of 25 per cent. of the crop. So far the 914 series has been the most popular, the demand for seed of this variety and others resistant to blight, e.g., Salaman Clarke 2, being greatly in excess of the supply. Dutch Robijn, though highly resistant to blight, is not immune, but it is a relatively heavy cropper and continues to find favour.

The pyrethrum [*Chrysanthemum cinerariifolium*] bud disease associated with *Ramularia bellunensis*, first recorded in 1946 [ibid., 26, p. 454], was equally prevalent but considerably less severe in 1947. Material for identification was received from localities as far distant from the original outbreak as Mount Elgon and the Belgian Congo.

The canker of *Cupressus macrocarpa* caused by *Monochaetia uniformis* [*R.A.M.*, 27, p. 455] appears to be still confined to the Rift Valley, where it is regarded as one of the major diseases of the host. In inoculation experiments only one unwounded tree out of six contracted infection, presumably through some natural injury. However, the symptoms developed in every case following the light rubbing of the foliage with carborundum powder or pricking with a fine needle.

It seems doubtful whether a sporadic virus disease of sweet potatoes is identical with the serious trouble reported from the Belgian Congo [ibid., 25, pp. 28, 154; 27, p. 376] and Uganda [ibid., 26, p. 145]. The Kenya disease has been transmitted

by grafting, the symptoms induced by which were of the severe bunchy top type, including vein-clearing, stunting and crinkling of the leaves, and virtual absence of the internodes.

Plant pathology.—*Rep. N.Y. St. agric. Exp. Sta., 1948*, pp. 26–33, 1949.

In this report [cf. *R.A.M.*, 27, p. 509] R. E. Foster and O. A. Reinking state that in the 1947 yield tests most of the Geneva cabbage breeding stocks resistant to yellows [*Fusarium oxysporum* f. *conglutinans*: ibid., 28, p. 103] yielded as well as, or better than the available commercial varieties both in New York State and Pennsylvania. Resistance tests showed that all Geneva stocks were 100 per cent. resistant to the disease, while commercial cabbage varieties listed as resistant included in several cases dangerously high percentages of infected plants.

According to W. T. Schroeder, the efficacy of the zerlate-Bordeaux schedule for the control of tomato diseases [ibid., 27, p. 164] was confirmed in the 1947 tests. Differences between the defoliation of sprayed and unsprayed plants due to early blight [*Alternaria solani*] were greatest in the varieties Longred, Wisconsin 55, and Rutgers, least in Gem, and intermediate in Red Jacket and John Baer. The incidence of late blight [*Phytophthora infestans*] fruit rot was greatest in unsprayed Rutgers while Longred and Wisconsin 55 appeared more field resistant. Gem and Wisconsin 55 were the most susceptible to anthracnose [*Colletotrichum phomoides*: ibid., 28, p. 313]. Yield differences between sprayed and unsprayed plots were one ton in Longred, approximately five in Gem, Wisconsin 55, Red Jacket, and John Baer, and 10 in Rutgers.

In seed treatment tests conducted by W. T. Schroeder and R. E. Foster, phygon was outstanding for pea [ibid., 28, p. 152], maize, spinach, and beet and excellent on cucurbit seed though injurious if the seed had previously been treated with mercuric chloride. Arasan [ibid., 28, p. 44] was equally effective on the same crops, but caused no injury to cucurbit seed after mercury treatment. It was also excellent for tomato seed, but caused severe injury after treatment with new improved ceresan. Spergon is still considered a good material for peas, because it does not retard growth and is less offensive to workers than arasan dust.

A. J. Braun states that in comparative tests for the control of grape vine black rot [*Guignardia bidwellii*: ibid., 28, p. 53] fermate (2–100) was more effective over a period of years than Bordeaux mixture, the former causing less spray injury. In 1947, fermate 1–100 and 2–100 gave as good control; the material at $1\frac{1}{2}$–100 is being recommended to replace Bordeaux mixture (4–4–100) for the control of the disease.

J. M. Hamilton reports that the following fungicides (given in decreasing order of merit) were tested on McIntosh apples for the control of scab [*Venturia inaequalis*: see above, p. 441]: bioquin 1 with orthex; phygon with goodrite p.e.p.s.; bioquin 1; phygon, which gave a good control early in the season, but secondary scab developed at harvest, and it was toxic to both tree and operator; puratized agricultural spray, which gave an erratic performance, and HL 331 (phenyl mercury acetate) a more effective and stable compound, but sometimes injurious; 341 C (2 hepta-decyl glyoxalidine); fermate, which is more effective on the fruit than on the foliage and is recommended for cover sprays or after bloom; and wettable sulphurs, still recommended as the basic fungicides. Bioquin 1, phygon, puratized, and HL 331 are both protective and eradicative when infection occurs, while 341 C, fermate, and the wettable sulphurs are protectants only.

Concluding his fertilizer experiments on the effect of soil and foliage applications of urea on the amount of apple scab infection, D. H. Palmiter found that as the amount of nitrogen applied to the soil (in the form of uramon) increased, the percentage of diseased fruit increased on the average from 27 to 39, but as the amount (in the form of nugreen) applied to the foliage increased, the percentage scab decreased from 35 to 31.

J. M. Hamilton records very severe attacks of peach leaf curl [*Taphrina deformans*: loc. cit.] during 1947. Trees sprayed in the autumn of 1946 with elgetol, dow DN dry-mix, dow DN 289, liquid lime-sulphur, and Bordeaux mixture at 2 quarts, 1 lb., 2 quarts, 3 gals., and 3 lb. copper-lime in 100 gals. had 7, 13, 9, 9, and 55 per cent. infected clusters, respectively. With double these concentrations there was 4, 4, 4, 2, and 23 per cent. infection, respectively. Spring applications of these fungicides allowed 11, 8, 24, 25, and 28 per cent. infected clusters at 1 quart, 1 lb., 0·8 quart, 3 gals., and 2½ lb. copper-lime in 100 gals., respectively, while the corresponding numbers for double concentrations were 3, 3, 18, 11, and 7 per cent. The effectiveness of a material was found to be directly proportional to the amount of leaf curl on the tree in the previous year. Zerlate proved a distinctly better protectant than sulphur in controlling brown rot [*Sclerotinia fructicola*: ibid., 27, p. 532]. Bioquin 1 was excellent, but repeated applications may cause injury. Goodrite z.a.c. was effective, but phygon appears to be the most promising material, especially for storage and transit [ibid., 27, p. 569], as it dries up broken tissue.

D. H. Palmiter reports a virus on English Morello and Montmorency sour cherries in several areas of New York, which appears to be identical with that causing X-disease of peaches and *Prunus virginiana* [ibid., 28, p. 222]. Affected cherry trees were always found in association with infected *P. virginiana* and the incidence of the disease was greatest in proximity to them. Symptoms on sour cherry include delayed bloom, extensive June drop (especially on English Morello), and the failure of remaining fruit to mature with full colour. Yellow to brick red pigment sometimes developed along the mid-vein of the leaves during late summer and autumn. Graft and bud inoculations of young cherry trees induced a wilt often followed by rapid death. The insertion of buds from infected *P. virginiana* caused similar symptoms. Inoculations from diseased sour cherry to peach resulted in typical X-disease symptoms. In one orchard 55 per cent. of the English Morello trees bore no fruit in 1947 due to the disease.

In field experiments for the control of sooty blotch of pears (*Gloeodes pomigena*) [ibid., 27, p. 429] D. H. Palmiter found that elgetol at 3 quarts to 100 gals. proved satisfactory, but where the disease is serious 4 quarts are recommended. Three applications of fermate (1–100) during June and July were more effective than wettable sulphur and caused no injury. Under conditions of severe infection a dinitro [*o*-cresol] application at the green tip stage followed by two late fermate cover applications are necessary.

Munoz (J.), Scherago (M.), & Weaver (R. H.). **A serological study of members of the Pseudomonas genus.**—*J. Bact.*, 57, 3, pp. 269–278, 1949.

To facilitate the identification and classification of members of the genus *Pseudomonas* [*R.A.M.*, 28, p. 273] a serological study of a representative group of strains was carried out at the University of Kentucky. A group of monotrichous strains that had the morphological and biochemical characteristics of *P. aeruginosa* [ibid., 21, p. 268] could be differentiated into two distinct serological groups, one of which was homogeneous and the other heterogeneous. A lophotrichous strain that had the same biochemical characteristics showed a marked flagellar relationship to the heterogeneous group. *P. fluorescens* was one of the species which was easily differentiated by serological reactions, but not by its biochemical characteristics. It is concluded that serological reactions are essential for the complete identification of members of this genus.

Hinke (F.). **Getreidebeizung ohne besondere Geräte.** [Cereal seed disinfection without special apparatus.]—*Pflanzenschutz*, 1, 1, pp. 2–4, 1948.

The preparations recommended for the control of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 28, p. 279], snow mould of rye (*Fusarium* [*nivale*: *Calonectria*

nivalis: ibid., 28, p. 164]), and other seed-borne cereal diseases in Bavaria are: (A) dusts, abavit-neu universal 46/47 (Schering AG, Berlin N65, and Braunschweig); ceresan-universal (U.T. 1875a), supplied by Farbenfabriken Bayer, Leverkusen; fusariol-universal (3140b) from Chem. Fabrik Marktredwitz AG, Marktredwitz; and germisan-universal (4099a), obtainable from Fahlberg-List, Magdeburg Südost, and Dr. Goeze & Co., Wolfenbüttel: (B) liquid, abavit 'Schering' 3330a; ceresan (U 564), Bayer; fusariol-neu universal (3456); and germisan.

The widespread lack of drums for dusting has necessitated the development of two makeshift procedures, which were tested in large-scale experiments at the Institute of Agriculture and Plant Protection, Munich, against bunt and snow mould. One is known as 'shovelling' and consists in pouring the seed on to the granary floor or outdoors on a concrete foundation, dusting with a fungicide, and thoroughly mixing with a shovel. In the 'stirring' process the seed is placed in a trough or vat, dusted, and well stirred with a small shovel or wooden peg. The incidence of infection by *T. caries* on Pörnbacher Graf Törring winter wheat, inoculated on 29th October, 1947, and dusted with ceresan (200 and 400 gm. per 100 kg.), was reduced from 24·4 per cent. (average of four plots) to a trace (maximum 0·4 per cent.) by the makeshift treatments, the smaller quantity of the dust being quite sufficient. In a parallel experiment carried out by F. Wagner at the Bayreuth branch of the Institute a reduction in the percentage of bunt from 54·7 to 0·07 per cent. was effected. Shovelling also gave good control of snow mould in greenhouse tests on Petkus winter rye, using ceresan at 200 gm. per 100 kg., the incidence of infection on the treated and untreated plants being 3·15 and 24·6 per cent., respectively.

Oswald (J. W.). **Cultural variation, taxonomy and pathogenicity of Fusarium species associated with cereal foot rots.**—*Phytopathology*, 39, 5, pp. 359–376, 2 figs., 3 diags., 1949.

Species of *Fusarium* were commonly encountered in a study of the cereal root rot complex in California, and their importance in the etiology of the disease prompted a study of their cultural variations, taxonomy, and pathogenicity [*R.A.M.*, 26, pp. 218, 267].

Pure cultures on potato dextrose agar were secured by the direct isolation of 20 single conidia of each collection from the first mycelium advancing from diseased host tissue. Identification was effected by reference to Wollenweber and Reinking's monograph on the genus [ibid., 14, p. 708]. Some of the isolates were readily recognizable as definite species, but others were transitional between species and sections and were arbitrarily designated by the most appropriate binomial. Isolates of *F. graminearum* [*Gibberella zeae*], *F. culmorum*, *F. sambucinum*, *F. equiseti*, *F. scirpi*, and *F. avenaceum*, representing the sections *Discolor*, *Gibbosum*, and *Roseum* [ibid., 25, p. 366], were included in the experimental material.

Every isolate of each species fell into one of two major cultural types, of which I (commonly found in nature) produced abundant aerial mycelium, with the conidia in sporodochia, while II was characterized by appressed, slimy growth due to the presence of numerous conidia in pionnotes. Two isolates of the latter type were obtained directly from nature, but as a rule they occurred as cultural variants. Analyses of type I cultures of isolates propagated by the single spore technique through three to four generations [cf. ibid., 14, p. 749] revealed (in cultures over three weeks old) frequent variants of type II, but in no case did any of the latter (278 tested) revert to type I. Only when the mass transfer technique was used did a type II culture arise that subsequently reverted to type I, and this was interpreted as a segregating-out of type I nuclei perpetuated from the outset by mass transfer.

Many of the variants, compared from a taxonomic standpoint with their parent cultures, could no longer be regarded as belonging to the same species, while

occasionally they had even to be relegated to different sections. Thus, a variant of *G. zeae*, with conidia measuring 62·4 by 49 μ, had to be reclassified as *F. subglutinatum* var. *elongatum*; three variants arising from *F. culmorum* (28·4 by 3·5, 38·4 by 4·9, and 35·9 by 4·5 μ) were, respectively, *F. reticulatum* f. 1, *F. sambucinum*, and *F. flocciferum* [ibid., 19, p. 5]; a variant of *F. equiseti* (56·2 by 3·8 μ) could not be referred to any existing species; and a transference from the section *Gibbosum* to that of *Roseum* was necessitated by a variant of *F. scirpi* producing no conidia.

The pathogenicity of each isolate and variety was determined by means of greenhouse pot tests on wheat seedlings. All the isolates of every species except *F. scirpi* and *F. sambucinum* were pathogenic to some extent, and a culture of *F. sambucinum* that arose as a variant from *F. culmorum* was slightly virulent. The disease ratings for *G. zeae* ranged from 5 (plants killed before emergence) to 0·7 (0 representing a healthy, vigorous plant with no crown or root discoloration), and those of *F. culmorum* from 4·5 to 0·1. In fact, the range of pathogenicity within a single species, such as *G. zeae* or *F. culmorum*, was similar to that of the whole group of species and sections. All the variants of cultural type II were significantly milder in their parasitism than the parental types.

The evidence here presented is regarded as demonstrating the interrelationship of the *Fusarium* isolates of the sections *Gibbosum*, *Roseum*, and *Discolor*, both on a taxonomic and a pathogenic basis; and it further lends support to Snyder and Hansen's proposal to group the species, forms, and varieties of these sections into a single species, *F. roseum*, with the designation of forma *cereale* for all strains of proved pathogenicity to cereals [loc. cit].

Hughes (S. J.). **The perithecia and pycnidia of Leptosphaeria nigrans.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 63–68, 2 figs., 1949.

In April, 1944, the author found *Leptosphaeria nigrans* [*R.A.M.*, 27, p. 462] in association with an *Ophiobolus* on cereal stubble. The more or less clavate asci measured 74 to 109 by 9 to 12·6 μ and the very pale brown, slightly curved ascospores, mostly six-celled, with the second cell from the apex always swollen, 18 to 24 by 3·5 to 5 μ. The ascospores produced pycnidia of the form-genus *Phaeoseptoria* in culture.

Baldacci (E.) & Forlani (R.). **Ricerche su varie razze di cereali, spontanei e coltivati, in relazione ad attacchi di Claviceps purpurea.** [Studies on various races of wild and cultivated cereals in relation to attacks by *Claviceps purpurea*.]—*Genet. agrar.*, 2, 1–2, pp. 73–84, 1948. [Latin and English summaries.]

A fungus isolated from sclerotia collected on various Gramineae during 1946 and cultured at the University of Palermo, has been provisionally designated as a new strain, p 5, of *Claviceps purpurea* [*R.A.M.*, 27, p. 67], which infects wheat (Gentil 48, Est, Mentana, Damiano), *Triticum durum*, *T. turgidum*, rye, barley, *Lolium perenne*, *L. italicum*, *L. temulentum*, and *Agropyron* sp. A higher percentage of infection was obtained by inoculating emasculated wheat ears than those left intact. Inoculations into sterile hybrids in which the male and female sterility were joined gave negative results.

Bonvicini (M.). **Prove sperimentali contro le ruggini del Frumento.** [Experimental trials against Wheat rusts.]—Reprinted from *Ital. agric.*, 79, 11, 6 pp., 1942. [Received March, 1949.]

Experiments each year from 1934 to 1938 showed that Bordeaux mixture, 1 per cent. copper-lime spray, sulphur dust, and asporital were effective against wheat rusts [*Puccinia* spp.] on the varieties Trentatré (Masolino), Damiano Chiesa, and Duecentoundeci (Carosella), copper-lime being the most effective in two years. The 1,000-kernel weights in 1935, 1936, and 1937 were higher for treated plants

than for untreated, and in 1938 the average yield for the copper-lime sprayed plants was 2·22 q. per ha. higher than the controls.

It is concluded that the effectiveness of copper-lime spray against wheat rusts was fully confirmed. Three spray applications ($\frac{1}{2}$ or 1 per cent.) properly timed appear sufficient because of their strong adhesiveness even in heavy and prolonged rain. The spray is less convenient and more expensive to apply (in point of manpower) than sulphur, but in view of other factors sulphur is more expensive in the long run.

Allard (R.W.). **A cytogenetic study dealing with the transfer of genes from Triticum timopheevi to common Wheat by backcrossing.**—*J. agric. Res.*, 78, 3–4, pp. 33–64, 7 figs., 1949.

The reactions of several generations of wheat plants (obtained by crosses involving *Triticum timopheevi* P.I. 94761 and an unnamed wheat selection) to stem [black] rust (*Puccinia graminis*) [*R.A.M.*, 28, p. 328] was determined in the field in Wisconsin in the summers of 1942, 1943, and 1944. Epiphytotics of the disease were induced by inoculating guard rows of a susceptible variety with races 19 and 56 early in the season. Other races occurred naturally, the most important being 15B [loc. cit.]. The selection parent, 2666A2–2–15–6–3, proved fairly resistant to leaf [brown] rust (*P. triticina*) [ibid., 27, p. 120] and none of the back-crossed progeny showed more than a light infection in any of the several years that they were under observation. Some of the back-crossed plants and their derivatives possessed very high resistance to brown rust that apparently came from *T. timopheevi*.

In each season a satisfactory epiphytotic of black rust developed, susceptible varieties such as the *vulgare* parent becoming infected early in the season. *T. timopheevi* had an apparently immune type of host response with pustules appearing only rarely and then late in the season. The F_1 plants appeared to be highly resistant until heading time when a few pustules were observed. These increased until 5 per cent. severity of infection was reached near maturity in 1942 and 1944 and 10 per cent. in 1943. Thus the black rust resistance of *T. timopheevi* is not completely dominant to the susceptibility of *T. vulgare*.

In 1943 when 70 back-cross plants were tested for black rust reaction, they appeared to fall into the following groups in the proportion of 28:31:11, respectively; (*a*) plants which were entirely free from rust or developed a few pustules late in the season, (*b*) fairly resistant, mainly from 1 to 5 per cent. infection, but occasionally reaching 40 per cent. in late-maturing plants, and (*c*) plants as susceptible as the *T. vulgare* parent. Simultaneously the proportions for 169 second back-cross individuals from 22 different first back-cross plants and 43 reciprocal second back-cross individuals from 7 first back-cross plants were 43:72:54 and 20:11:12, respectively. It appeared that the inheritance of the resistance of *T. timopheevi* to black rust might depend on no more than two major genes.

Apparently none of the resistance of *T. timopheevi* to races of rust occurring at Madison in 1944 was governed by recessive genes. During that year very few plants showing intermediate reaction were found, possibly because race 15B was not prevalent. The races of black rust occurring in 1944 would not differentiate between the progeny of the intermediate and resistant plants of 1943. Back-cross ratios suggested that a single major gene governs resistance, if the somewhat higher incidence of rust on intermediate plants resulted from local environmental effects rather than genetic differences.

A large number of F_2, F_3, and F_4 segregates from back-cross plants tested in 1944, fell into the proportion of 1,952:225:1,203, in the same three groups, illustrating the ease with which black rust resistance was maintained. Four F_4 families from the first back-cross, containing 11, 27, 45, and 89 individuals, included only resistant plants, indicating that their parents were homozygous for resistance

to black rust. Several of these lines have been grown to the F_7 generation and have been uniform for a high type of resistance. The data again suggest that relatively few major genes, possibly not more than two, control the resistance to the races of black rust which occurred at Madison in 1943 and 1944.

Studies of transmission of resistance to bunt in the same progeny were made using as inoculum a composite collection of smooth-spored *T. foetida* [ibid., 25, pp. 298, 300] from three localities in Wisconsin. The seeds were dusted with chlamydospores, planted in the greenhouse in soil maintained at approximately 10° C., and then covered with sand mixed with chlamydospores. In 1943–4 the highly susceptible varieties Progress and Reward and the *vulgare* parent were more than 90 per cent. infected with bunt. The F_1 plants were susceptible, but the symptoms were less pronounced. On the average the second back-cross families had slightly less disease than the *vulgare* parent. In three out of 19 families tested, more than 50 per cent. of the individuals remained healthy, with ratios of healthy to diseased plants of 11:9, 4:1, and 10:9. On the average F_2 (open-pollinated) plants from the first back-cross were considerably more resistant than the *vulgare* parent. In 10 of 15 families more than one-half of the plants and in two others 20 out of 23 and 17 out of 26 remained healthy. It appears that resistance to bunt is more frequently transmitted by the ovules than by the pollen of segregating plants.

In the next year all kernels obtained from bunt-free 1943–4 plants were grown. Again, a few families had more healthy than bunted plants and numerous partly bunted plants seemed to possess some measure of resistance.

These results suggest that it may be possible to transfer some of the bunt resistance of *T. timopheevi* to *T. vulgare* types.

Watson (I. A.). **Preparing for the occurrence of new races of rust.**—*Nature, Lond.*, 163, 4149, pp. 730–731, 1949.

Owing to the occurrence of new rust races in Australia, such as 126 *B* of stem [black] rust [*Puccinia graminis*] which attacked Eureka 2 in 1942 [*R.A.M.*, 25, p. 207], and a race of leaf [brown] rust (*P. triticina*) to which Gabo [ibid., 28, p. 280] became susceptible in 1945, a programme has been initiated in New South Wales to breed varieties which may be resistant to new races of rust when they appear.

From a back-cross of Gabo × Eureka 2, three lines in which black rust resistance has been added to Eureka 2 have already been obtained. Crosses are also being made individually with Eureka 2 on Hofed, Fedweb, Celebration, Charter, *T. timopheevi* × Steinwedel, Kenya 117A, wheat × rye, Khapli Emmer × Steinwedel, and *Triticum* × *Agropyron*; the resistant progeny may then be back-crossed to Eureka 2. It seems unlikely that all the resistant progenies would succumb at one time to the same rust.

Preparing Gabo for the occurrence of a new strain of black rust is more difficult, as this variety is already resistant to the Australian races. The progeny of the Gabo × Eureka 2 cross have been back-crossed twice to Gabo and after one more back-crossing (when probably sufficient of the Gabo genotype will have been recovered) a susceptible strain can be selected to which may be added in turn the resistance of the varieties in the above collection. This should give a series of selections with differing powers of rust resistance. The programme does not at present include breeding for brown rust resistance, but it is proposed to combine the two as soon as practicable.

Holton (C. S.), Bamberg (R. H.), & Woodward (R. W.). **Tester races for dwarf bunt resistance factors in winter Wheat varieties.**—*Agron. J.*, 41, 6, pp. 250–252, 1949.

The determination of varietal reaction to dwarf bunt of wheat (*Tilletia tritici*)

[*T. caries*: see next abstract] is complicated by the uncertainty of chlamydospore germination. During the last 16 years, less than half the tests in soils believed to be naturally infested in the Pacific Northwest have been successful. In an attempt to solve this problem 23 wheat varieties and hybrid selections were inoculated with the common physiologic race of bunt T-16 [*R.A.M.*, 25, p. 209] and a hybrid selection (designated as Hybrid 119) from a cross between dwarf bunt and T-8, made by a method previously described [ibid., 27, p. 228].

The tests were successful in five years at the Montana and Utah Agricultural Experiment Stations and in one year at the Idaho Station. The varieties and selections fell into four categories in respect of reaction to dwarf bunt, three susceptible (over 5 per cent. average infection at all stations) and one resistant (under 5 per cent.). Group 1 comprises Hybrid 128, Elgin, and Golden, with 51, 43, and 33 per cent. infection, respectively. These varieties, of which the first-named is one of those used for the differentiation of common bunt races, have no known resistance factor either for dwarf bunt or any race of common bunt. The group 2 varieties, namely, Oro (differential for common bunt), Rio, Yogo, Rio × Alicel, and Alicel × Oro, with 23, 41, 38, 52, and 30 per cent. infection, respectively, possess the Turkey type of resistance to bunt (susceptible to T-16 and L-8 only) and are completely susceptible to the dwarf form. Group 3 consists of Ridit (differential), Cache, Brevon, Hohenheimer (differential), and Hussar × Hohenheimer (differential), with 6, 5, 22, 13, and 8 per cent. infection, respectively. The degree of resistance in this group does not suffice to confer protection under conditions of severe infestation. The resistant group 4 comprises ten varieties, of which the first four are differentials, viz., Albit (4 per cent. infection), Hussar (1), Martin (1), White Odessa (2), Hymar (3), Rex (4), Rex × Rio (1), Turkey (2), Relief (1), and Wasatch (1). The resistance of these varieties is of the Martin type, connoting ability to withstand infection by dwarf bunt and the common bunt races T-16 and L-8, to which the members of group 2 (Turkey type) are susceptible. In other words, resistance to T-16 and L-8 appears to be coupled with a similar reaction to dwarf bunt, while susceptibility to these three races seems to be related in the same way. The results of another series of tests carried out in 1947 and 1948 indicated that the reactions induced by T-16, Hybrid 119, and dwarf bunt are virtually identical, so that either of the two first-named can be used as a tester race for dwarf bunt resistance factors. Of the four varieties included in this series of tests which were not represented in the first, i.e., Comanche, Pawnee, Nebred, and Alicel × Rex, only the last-named was resistant.

Woodward (R. W.) & Holton (C. S.). **Inheritance of reaction to dwarf bunt, race T-16, and a hybrid in winter Wheat crosses.**—*Agron. J.*, 41, 6, pp. 253–254, 1949.

At the Utah Agricultural Experiment Station in 1946, the seed from each large F_2 plant of three winter wheat crosses (Cache × Utah Kanred, Relief × Requa, and Cache × Brevon) grown under irrigation was divided into four lots, of which three were inoculated with the Hybrid 119 and T-16 bunt (*Tilletia tritici*) [*T. caries*] races and one planted in dwarf bunt-infested soil [see preceding abstract].

Resistance and susceptibility to the dwarf bunt race appears to be controlled by a single factor in three Cache × Utah Kanred crosses, the F_3 rows of which fell into 166 resistant, 231 heterozygous or segregating, and 137 susceptible, 20 to 60 per cent. infected heads, and a ratio of 1:2:1 for dwarf bunt; (2) for Hybrid 119, 28, 48, 24, 35 to 90 per cent., and 1:2:1, respectively; and (3) for T-16, 120, 246, 129, 35 to 90 per cent., and 1:2:1, respectively. The mode of inheritance was more complicated in a cross of Requa × Relief and still more so in Cache × Brevon (1 to 15 and trace to 5 per cent. infection, respectively), and no ratios are given for these two. The parents showed the following percentages of dwarf bunt (average of

five to eight tests) when grown on naturally infested soil under dry farm conditions: Brevon 16, Requa 2, Cache 4, Relief 2, and Utah Kanred 60.

A single factor pair for resistance and susceptibility was observed when the seed of Cache × Utah Kanred was inoculated with T-16 or Hybrid 119. In this cross it appears that the reaction to the hybrid race of bunt is controlled by the same factor pair as is the response to dwarf bunt. Reactions to T-16 were more variable, but the factor pair involved was apparently the same, and it might be possible to substitute either this race or the hybrid for dwarf bunt as a means for the isolation of segregates.

Ledingham (R. J.), Sallans (B. J.), & Simmonds (P. M.). **The significance of the normal flora on Wheat seed in inoculation studies with Helminthosporium sativum.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, pp. 10-11, 1949.

The results of tests at the Dominion Laboratory, Saskatoon, showed that when wheat seed was treated with formalin prior to inoculation with *Helminthosporium sativum* [*R.A.M.*, 27, p. 229 and next abstract] the lesions were increased (particularly when the seedlings were grown in sterile soil or on other sterile media), due to the removal of the surface flora, especially the antibiotic bacteria which inhibit the pathogen [loc. cit.].

The abundance of surface flora may vary appreciably in different samples of wheat of a given variety; in resistance tests, accordingly, this variability results in variations in disease ratings. By proper surface disinfection of the seed prior to inoculation a truer measure of basic resistance of the variety is achieved, and likewise, more uniformity of results within any pure line.

Sallans (B. J.), Ledingham (R. J.), & Simmonds (P. M.). **Testing Wheat seedlings for resistance to Helminthosporium sativum, with reference to antibiosis.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, p. 11, 1949.

By using formaldehyde solutions acidified with lactic acid the bacterial flora on wheat seed prior to inoculation with *Helminthosporium sativum* [see preceding abstract] was almost completely removed, thus enabling a truer picture of the inherent resistance of wheat varieties and lines to be obtained. A significant negative correlation was found between the proportion of seed carrying bacteria and the disease ratings of the resultant seedlings following seed inoculation. A number of varieties were found to be much more resistant to *H. sativum* than those commonly grown.

Davies (F. R.), Henry (A. W.), Jackson (A. W.), & Gilpatrick (J. D.). **Influence of saprophytic micro-organisms on the sporulation of Ophiobolus graminis Sacc.** —Abs. in *Proc. Canad. phytopath. Soc.*, 16, p. 12, 1949.

Under field conditions in Alberta *Ophiobolus graminis* [*R.A.M.*, 26, p. 8] sporulates occasionally on the basal parts of its host plants; on artificial media it usually fails to do so. In a culture contaminated with a bacterium and a fungus, *O. graminis* produced abundant perithecia. Tests showed that the bacterium stimulated sporulation whereas sterile culture filtrates of the organism failed. It induced sporulation in four different strains of *O. graminis* on potato dextrose agar after a month at room temperature when exposed to light [cf. ibid., 28, p. 318] but not when kept in darkened incubators at 10° to 25° C.

None of over 450 other isolates of bacteria, fungi, and actinomycetes tested in artificial culture possessed the ability to stimulate sporulation of *O. graminis*. In one experiment with inoculated wheat seedlings 96 per cent. growing in unsterilized and 8 per cent. in sterilized soil produced perithecia.

In preliminary studies biotin stimulated the growth of two strains of the pathogen tested, whereas thiamine did not. However, thiamine in the presence

of biotin stimulated growth and with one strain the combination of both vitamins induced the formation of bodies resembling immature perithecia.

Rundquist (J. F.), Dungan (G. H.), Bonnett (O. T.), & Koehler (B.). **Evaluation of winter Wheat varieties for Illinois.**—*Circ. Ill. agric. Exp. Sta.* 625, 4 pp., 1948.

Reaction to wheat mosaic virus [*R.A.M.*, 27, p. 128; 28, p. 280] was one of the characters assessed in the course of variety trials in Illinois from 1943 to 1947. Very susceptible to the disease were Blackhawk, Clarkan, and Wasatch, and moderately susceptible Pawnee, Comanche, Brill, Marmin, Turkey, Wisconsin 2, Kawvale, and Cache.

Rundquist (J. F.), Dungan (G. H.), Bigger (J. H.), Lang (A. L.), Koehler (B.), & Jugenheimer (R. W.). **Illinois hybrid Corn tests 1947.**—*Bull. Ill. agric. Exp. Sta.* 527, pp. 525–557, 1 map, 1948.

The following items of phytopathological interest appear in this bulletin [cf. *R.A.M.*, 27, p. 278]. Surveys made in 37 counties showed that direct damage to maize from stalk rot was about 5 per cent., of which 33 per cent. was due to *Diplodia zeae* and 25 per cent. to *Gibberella zeae* although the latter was more prevalent in northern Illinois. In southern Illinois 1·4 per cent. of the stalks were damaged by charcoal rot [*Macrophomina phaseoli*: ibid., 26, p. 140]. A moderate amount of stalk rot was also attributed to *Fusarium moniliforme* [*G. fujikuroi*] and *Nigrospora oryzae*. On the whole, stalk and root rots caused the most serious damage to maize grown in the State during 1947, the yield being reduced to an average of 39·5 bushels per acre.

The percentage of ear rot (due to a variety of fungi) was low (less than 2·5 per cent.) on all fields during the year, *G. fujikuroi* being the most prevalent fungus on damaged kernels.

Loss from smut [*Ustilago maydis*: ibid., 26, pp. 391, 393] was estimated at only 0·5 per cent., while Stewart's disease [*Xanthomonas stewarti*: ibid., 28, p. 283] was observed especially in canning maize in Iroquois and Vermilion counties and in non-resistant garden varieties of sweet maize in central and south-central Illinois. In late summer, leaf symptoms were very common on field maize except in the northern third of the State.

Pittman (H. A. J.). **Principal diseases of Lemons in Victoria and their control.**—*J. Dep. Agric. Vict.*, 47, 3, pp. 117–122, 8 figs., 1949.

The principal diseases of lemons in Victoria are *Armillaria mellea* [*R.A.M.*, 26, p. 337; 28, p. 214], which usually follows rushed planting on ground not properly cleared of tree and scrub remains; collar rot and brown rot [*Phytophthora* spp.; ibid., 27, p. 70]; shell bark [*Diaporthe citri*: ibid., 27, p. 116], which is sometimes found in the Murray River Valley, particularly at Cobram and also at Wangaratta; anthracnose [*Colletotrichum gloeosporioides*: ibid., 23, pp. 104, 249], frequently following attacks by other fungi or malnutrition; citrus pit [*Pseudomonas syringae*: ibid., 23, p. 128]; and *Septoria* spot [*S.* spp.: ibid., 17, p. 223; 22, p. 343]. The risk of attack by *A. mellea* may be greatly reduced by ring-barking the original vegetation and allowing it to die out slowly thus greatly exhausting the starch content of the roots. As the lemon trees mature great care should be taken that soil, water, organic matter, or fertilizers are not applied closer than 18 in. to the base of the trunk. To prevent collar rot and the crown rot phase of *A. mellea* young trees should be planted on a mound or in a depression. In the case of root rot, iron sulphate solution applied in autumn and spring at 1 lb. in 5 gals. water, using 15 to 20 gals. for large trees, may be poured into a saucer-shaped depression some 3 ft. in radius around the trunk. Additional iron sulphate crystals are sprinkled

evenly over the undisturbed area extending well out into the space between adjoining trees, at 3 to 4 lb. to each well-grown tree. After the water in the depression has seeped away the earth should be filled in except for a region about 1 ft. in radius and 9 in. deep around the trunk, allowing free circulation of air around the butts of the main roots. *A. mellea* sporophores may be destroyed by treatment with iron sulphate. Inarching of young trees or bridge-grafting across large wounds may help to rejuvenate large trees on which surgical operations have been extensive.

To control brown rot, anthracnose, and citrus pit, dead wood and excess branches should be periodically removed, the wounds being kept covered with white-lead paint, bituminous paint, Stockholm tar, or Bordeaux paste. To control brown rot, branches in contact with the ground should be cut back, weed growth suppressed, and cover crops prevented from growing up into a dense mass entangled in the branches of the trees. The trees should be sprayed in late autumn or early spring with a 3–3–50 home-made Bordeaux mixture, plus ½ gal. prepared white spraying oil to each 50 gals. spray, ensuring that the main stem bases and the whole of the main trunk, and the ground beneath the tree receive an application. *Septoria* leaf and fruit spot may be controlled by spraying with home-made Bordeaux (3–3–50) in late summer or early autumn.

Citrus trees should not be fumigated with cyanide after Bordeaux mixture, for at least six months. Bordeaux mixture may be applied a fortnight after fumigation without harm. For collar rot, shell bark, or wound treatments in districts where cyanide fumigation is carried out, growers are advised to use a paste consisting of 1 lb. zinc sulphate, ⅕ lb. copper sulphate, and 1 lb. fresh hydrated lime to 1 gal. water instead of the usual formula for Bordeaux paste.

PENMAN (F.). **Boron poisoning in Citrus.**—*J. Dep. Agric. Vict.*, 47, 4, pp. 181–189, 8 figs., 1949.

In 1947, a limited number of citrus trees growing on the heavier types of soil in irrigated areas of northern Victoria showed boron poisoning symptoms. The boron content in leaves of affected trees always exceeded 500 p.p.m. Boron native to the soil is considered the main source of the trouble. Washington Navel and Late Valencia oranges on citronelle stock were more affected than those on sour orange, while those on sweet orange stock were only slightly affected.

It is recommended that citrus planting should be restricted to deep permeable sands. The adjustment of the proportions of other plant nutrients may correct the disorder. 'Skeleton pruning' in early spring is also suggested.

KNIGHT (R. L.). **The genetics of blackarm resistance. VII. Gossypium arboreum L.** —*J. Genet.*, 49, 2, pp. 109–116, 1948.

The immunity of Multani (Sanguineum) cotton, strain NT 12/30 belonging to *Gossypium arboreum* race *bengalense*, from *Xanthomonas malvacearum* [*R.A.M.*, 27, p. 280; 28, p. 332], even after repeated spraying with inoculum, is shown to depend on a major gene B_4, with a strong complex of minor genes. Although no such strong complex has ever been found in cottons of immediate New World origin, work in progress suggests that a similar form of control exists in *G. herbaceum* var. *acerifolium* from India [ibid., 28, p. 15]. From these and other data, it is argued that the Indian cottons have been subjected to a selection pressure by blackarm for a longer period than the New World cottons, suggesting that the disease originated in the Old World, probably India.

KIELY (T. B.). **Black spot of Citrus. Recommendations for control on the central coast of New South Wales.**—*Agric. Gaz. N.S.W.*, 60, 3, pp. 137–139, 1 fig., 1949.

To control citrus black spot [*Guignardia citricarpa*: *R.A.M.*, 28, p. 285] on Valencia oranges, the most serious economic disease of citrus fruit in the central

coast areas of New South Wales, the author recommends the following programme. For young trees up to ten years old a petal fall application of Bordeaux mixture (4–4–80) plus ½ gal. white spraying oil to each 80 gals. as sticker, followed after six to eight weeks by a 2–2–80 Bordeaux application, combined with a scalicidal white spraying oil (1 in 40). For fairly vigorous trees up to 20 years Bordeaux applications (2–2–80) should start at petal fall and be repeated at six and 12 weeks with white spraying oil ½ in 80 for the first and third sprays, and at 1 in 40 for the second. For old trees four 1½–1½–80 Bordeaux applications at intervals of five weeks beginning at petal fall are advised. For trees in a good state of vigour, the concentration can be increased to 2–2–80. Pressures of 300 lb. are recommended and quantities up to 10 gals. per large tree per application.

Sackston (W. E.). **The effect of DDT and 2, 4-D on some diseases of Flax.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, pp. 16–17, 1949.

The results of greenhouse experiments indicated that spraying with DDT had no effect on the reaction of various flax varieties to pasmo disease (*Septoria linicola*) [*Sphaerella linorum*: *R.A.M.*, 27, p. 554]. Susceptible field-grown flax plants treated with 2,4-D [2,4-dichlorophenoxyacetic acid] at 0, 2, and 4 [fl.] ozs. per acre and inoculated with *S. linorum* or *Melampsora lini* [loc. cit.] developed typical pasmo and rust symptoms. Previous exposure to fumes of 2,4-D did not affect the reaction of Bison flax to pasmo, rust, or anthracnose (*Colletotrichum lini*) [*C. linicola*: ibid., 26, p. 404]; no infection resulted in any of the plants inoculated with *Polyspora lini* [ibid., 25, p. 297].

Notes by the Biological Branch. Corm rot diseases of the Gladiolus.—*J. Dep. Agric. Vict.*, 47, 3, pp. 125–129, 7 figs., 1949.

The principal corm rot diseases of gladioli in Victoria, which can cause devastating losses particularly during storage unless control measures are taken, are *Bacterium marginatum* [*R.A.M.*, 27, p. 421] which is aggravated by bad drainage, *Septoria gladioli* [ibid., 25, p. 303], *Botrytis* core rot (probably *B. gladioli*) [ibid., 25, p. 501; 28, p. 399], *Sclerotinia gladioli*, and *Penicillium gladioli* [ibid., 20, p. 468].

Small batches of corms may be disinfected by immersion for five to ten minutes in mercurous chloride (1 oz. to 1½ pints water). The final disinfection should be made before the corms have sprouted. Large craters or pits caused by *Bact. marginatum* can be completely disinfected by immersing the corms in mercuric chloride (1 : 1,000) plus Agral II (1 : 2,000) for 12 to 24 hrs. Rare or valuable corms are surgically treated by cutting out all diseased tissue and dipping the cut surfaces in slaked lime or flowers of sulphur, or an equal mixture of both. The uninjured surfaces may be disinfected by wiping with methylated spirit several times and allowing each application to dry. When the leaves appear through the ground, attacks by *Septoria gladioli*, *B. cinerea* or *B. gladioli*, *Sclerotinia gladioli*, or *Bact. marginatum* may be prevented by periodic sprays with Bordeaux mixture (4–4–40) plus Agral II (1 : 2,000) or else containing ½ gal. prepared white spraying oil to every 40 gals. spray, applications early in the growing period and immediately after flowering being particularly valuable, while fortnightly sprays before the first flowers open will prevent leaf and flower spotting fungi.

Comeadow (W. A.). **New fungicides for Gladiolus.**—*Gladiolus Mag.*, 12, 5, pp. 9–11, 40, 1948. [Abs. in *Chem. Abstr.*, 43, 10, p. 3961, 1949.]

Botrytis blight and rot [*B.* (?) *gladiolorum*: see preceding abstract], dry rot [*Sclerotinia gladioli*], and hard rot [*Septoria gladioli*] of *Gladiolus* have been effectively combated in Australia [loc. cit.] by 48 hours' immersion of the corms (or a

shorter period for young ones) before planting in a solution of keotized mercury E (an animal oil emulsion of phenyl mercuric acetate), 1 oz. in 1½ gals. water. Freshly dug corms should also be dipped for 15 minutes. No toxic effects have been experienced in handling the diluted emulsion, but it corrodes metal containers.

Pirone (P. P.). **Diseases and pests of the Peony.**—*J. N.Y. bot. Gdn*, 50, 593, pp. 104–107, 4 figs., 1949.

Bud blight of peonies caused by *Botrytis* [*paeoniae*: *R.A.M.*, 22, p. 170] can be controlled by burning above-ground plant parts in the autumn, removing heavy mulches early in the spring, providing adequate air and water drainage around the clumps, and, in some cases, by spraying the new growth several times at weekly intervals in late spring with a copper fungicide [loc. cit.]. Non-parasitic bud blight is probably caused by a combination of potassium deficiency and low temperatures in the spring. The variety Avalanche appears to be particularly susceptible to attack by *Phytophthora cactorum* [loc. cit. and ibid., 27, p. 555].

Riley (H. K.) & Daigle (C. J.). **Spray tests for Azalea petal blight.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 651–653, 1948.

Azalea [*Rhododendron*] petal blight (*Ovulinia azaleae*) [*R.A.M.*, 28, p. 293] was effectively controlled at Lafayette, Louisiana, in 1947, by spraying with dithane starting at the flower-opening stage, and repeating at 48-hour intervals until the plants were in full bloom. Phygon gave effective control, but caused serious bleaching of flowers when exposed to sun; it was less injurious in shady locations.

Blumer (S.). **Der Cinerarien-Rost.** [Cineraria rust.]—*Schweiz. Gart., 1948*, 9, pp. 274–276, 2 figs., 1 diag., 1948.

Coleosporium senecionis [*R.A.M.*, 28, p. 217], the agent of cineraria rust, can maintain itself in the uredo stage for years at a time either on *Senecio vulgaris* or cineraria in Switzerland, dispensing in this abbreviated life-cycle both with the aecidial phase on pines and the teleuto on *S. vulgaris*. In inoculation experiments the pathogen was readily transmitted from cineraria to *S. vulgaris* and vice versa. Thus, the most effective precaution against the rust consists in the eradication of *S. vulgaris* from the vicinity of cineraria plantings. Two of the three cineraria varieties used in the writer's experiments were highly susceptible, while a measure of resistance was shown by one named Kenner.

Valenta (V.). **Mykologické poznámky I.** (Mycological notes I.)—*Acta Acad. Sci. nat. Morav.-Sil.*, 20, 6, 10 pp., 6 figs., 1948. [English summary.]

In the winter of 1947–8 the author isolated from distorted greenhouse *Cyclamen persicum* plants in Bratislava, Slovakia, in addition to *Penicillium brevi-compactum* a strain of *Cephalosporium sclerotigenum* which differed from that described by Moreau (*Rev. Mycologie*, N.S., 6, 3–4, pp. 49–94, 1941) in producing fewer sclerotia. In culture the pale rose mycelium consists of hyaline hyphae measuring 1·5 to 2·5 μ in diameter. The simple, erect, non-septate, hyaline conidiophores tapering at the apex, are 2 to 2·5 μ in diameter at the base, and 17 to 40 μ long. The aggregated, hyaline, cylindrical or oblong conidia, borne in spherical drops, measure 3 to 6 by 1·3 to 1·6 μ. The mostly globose sclerotia are dispersed in the mycelium and measure 21 to 52 μ in diameter and may be up to 70 by 52 μ.

In the summer of 1944 the leaves, sepals, petals, and anthers of garden carnations were attacked by *Heterosporium echinulatum* [*R.A.M.*, 25, p. 185]; the mycelium sometimes penetrated into the pollen-grains.

In September, 1944, a tomato fruit was found infected with *Gloeosporium* [*Glomerella*] *lycopersici* [ibid., 14, p. 725], reported for the first time from Czechoslovakia.

Green (D. E.) & Hewlett (M. A.). **Die-back of Cytisus cuttings.**—*J.R. hort. Soc.*, 74, 7, pp. 310–312, 2 figs. (fig. 111 between pp. 298–9), 1949.

Cuttings of *Cytisus scoparius* and its varieties Mrs. W. A. Slocock, Plantagenet, Andreanus, Johnson's Crimson × Burkwoodi, Fairy Queen, and Criterion, and of *C. pallidus* suffering from die-back were recently submitted to the Royal Horticultural Society's laboratory at Wisley, Surrey. The leaves bore numerous small, black spots and most of the shoots were defoliated. The younger ones had died back and were shrivelled and blackened, while sunken, bluish-black patches occurred here and there on the thicker shoots. The fungus isolated from the tissues on nutrient media (of which prune agar at pH 6·2 favoured rapid growth) was identified as *Ceratophorum setosum* [*R.A.M.*, 28, p. 381], previously reported on lupins in England (*J. R. hort. Soc.*, 58, pp. 144–145, 1933), on the same host and *Cytisus adami* in Italy [*R.A.M.*, 7, p. 582], and on lupins, *C. scoparius*, and *C. hybridus* in Germany [ibid., 18, p. 460]. The fungus has also been recorded on *C. capitatus* and *C. laburnum*, of which the former proved the more susceptible in tests at Wisley. Of the species and varieties included in the present study, Fairy Queen, Criterion, and *C. pallidus* were less severely affected than the others. One or two light treatments with a colloidal copper spray or Bordeaux mixture should be applied for the control of *Ceratophorum setosum*, a potentially dangerous parasite under the conditions in which young plants are raised.

Hughes (S. J.). **Studies on some diseases of Sainfoin (Onobrychis sativa). II. The life history of Ramularia onobrychidis Allescher.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 34–59, 1 pl., 22 figs., 1949.

Continuing his studies on sainfoin (*Onobrychis sativa*) diseases [*R.A.M.*, 25, p. 166], the author states that *Ramularia* leaf spot (*R. onobrychidis*) [loc. cit.] has so far been observed in Great Britain only in South Wales, where it was found on the local strain of common sainfoin and later on the Hampshire and Cotswold commercial strains.

When young the spots are dark brown, but as they enlarge they grow paler from the centre outwards and produce either a ring spot or a uniformly pale one. They are always darker on the adaxial than on the abaxial side of a leaflet. Sporulation, restricted to dead tissues, occurs all the year round, most actively from late spring to early autumn. In suitable conditions numerous sporodochia form, their conidial chains covering both surfaces of the spot with a white meal. Towards the end of November spore production is superseded by sclerotial formation. In old spots sclerotia form a distinct, greyish ring, and when waterlogged the individual sclerotia can be seen with the naked eye as a circle of black dots round the effete remains of the sporodochia and conidiophores. In younger spots, which have not produced sporodochia, the sclerotia are aggregated towards the centre. Infected leaflets fall readily when disturbed or may dry out while attached to the midrib. In summer the conidiophores form a circular area on the spot, but in winter they develop from sclerotia and occur as a mealy ring.

Both stomatal and cuticular penetration by germinating spores occur. Hyphae, mostly intercellular, are found in all parts except the xylem, but also commonly occur inside epidermal cells.

In *R. onobrychidis* the sporodochia are confined to the substomatal cavities. The conidiophores protrude in tufts through the dilated stomatal pores, between the crushed guard cells. They are unbranched, filiform, hyaline, bi- to tri- or multi-septate, with the basal cell usually swollen; they are narrower than the conidia and measure 30 to 50 by 2 to 3·5 μ. Each conidial chain, after dispersal, leaves a scar on the conidiophore. Up to seven scars have been seen on one conidiophore, restricted to the terminal cell. The conidiophore

may be geniculate or faceted, according to the position of the scar, but is usually faceted.

The hyaline conidia are 7 to 42 μ long and vary in form from phragmospores through didymospores to amerospores. The first conidium arises as a globose, apical swelling; it lengthens out, becomes oval, and finally is almost cylindrical with a slightly tapering base and basal septum. The conidium may or may not become variously septate. As a result of successive acropetal budding a chain of up to seven conidia, in which all three types of spore may be present, is produced, the distal ones being amerospores. Quite commonly branched chains develop. The conidia are dry blastospores and, presumably, are dispersed by wind. In the author's collections the phragmospores measure 23 to 42 μ long, the didymospores 12 to 34 μ, and the amerospores 7 to 22 μ. The spores ranged from 2·7 to 6·3 μ in width (mean from all collections, 4·7 μ). A dry atmosphere favours the production of longer, narrower conidia with more septa, while moist air promotes the development of shorter spores with fewer septa.

Mature sclerotia consist of a subglobose body with a short, more or less constricted neck protruding through a greatly dilated stomatal aperture and slightly raised above the general level of the epidermis. The sclerotia range from 38 to 101 μ in diameter and develop under the epidermisal layers. The body consists of a homogeneous plectenchyma, the cells walls of which are thickened and brown; the walls of the outermost layers of cells are only slightly, if at all, thicker and darker than those of the core cells. The sclerotial neck is characteristically composed of regularly radially arranged cells and resembles a closely packed fascicle of pale brown, slightly thick-walled, septate hyphae with round distal ends. The sclerotia germinate readily in field and laboratory conditions to produce conidiophores and chains of conidia.

Single spore isolations of the various spore forms from summer spots and germinating sclerotia gave similar cultures. The disease was reproduced with difficulty when healthy sainfoin leaflets were inoculated with a spore suspension of the fungus, *R. onobrychidis* being re-isolated from the spots.

No perithecial stage was found, and the fungus probably overwinters in South Wales by means of the sclerotia.

The fate of the original species of *Ramularia* is discussed and the history of the genus is related.

Hughes (S. J.). **Studies on some diseases of Sainfoin (Onobrychis sativa). III. Leaf spot caused by Septoria orobina Sacc.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 60–62, 1 fig., 1949.

In June, 1942, sainfoin (*Onobrychis sativa*) in an experimental plot in Glamorgan developed round, fawn leaf spots up to 6 mm. in diameter and without a distinct margin, caused by a species of *Septoria*. The fungus was characterized by globose to pyriform pycnidia 48 to 128 μ in diameter (average 73 μ, mostly 68 μ), pale brown, with darker-walled cells round an irregularly circular pore 11 to 23 (average 15) μ wide, often borne on a short papilla, opening at the surface of the leaflet. The hyaline, filiform, straight or sometimes slightly curved pycnospores, rounded at the ends, measured 15 to 40 (average 27, mostly 28) μ long and about 0·8 to 1 μ wide; at first continuous and finely guttulate they were later mostly triseptate. The fungus is identified for the time being as *S. orobina* [*R.A.M.*, 27, p. 462].

When sainfoin plants were sprayed with a spore suspension of the organism, kept in a moist atmosphere for two days, and then placed outdoors, infection readily occurred, most of the infected leaflets falling off after a few days. Pycnidia developed and spores were produced in 10 to 14 days. The fungus was still strongly pathogenic to sainfoin after two years in culture.

Slykhuis (J. T.). **Sweet Clover failure in southwestern Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, p. 16, 1949.

Farmers in Essex and Kent counties, Ontario, experience increasing difficulty in growing productive stands of biennial sweet clovers (*Melilotus alba* and *M. officinalis*). Some fields have thin and poor growth during the first summer. In 1947 the failure was found in several instances to be correlated with an abnormally low calcium and high acid condition of the soils. The following spring a destructive and widespread root rot associated in almost every case with a species of *Phytophthora* [*R.A.M.*, 19, p. 708] reduced many stands by 75 to 90 per cent.

Thirumalachar (M. J.) & Dickson (J. G.). **Chlamydospore germination, nuclear cycle, and artificial culture of Urocystis agropyri on Red Top.**—*Phytopathology*, 39, 5, pp. 333–339, 2 figs., 1949.

Chlamydospores of *Urocystis agropyri* [*R.A.M.*, 27, p. 367] from red top (*Agrostis alba*) collected near Madison, Wisconsin, were germinated and stained by the method described by Thirumalachar for rust teleutospores [ibid., 27, p. 136].

The first report of the successful germination of chlamydospores of *U. agropyri* from *A. alba* was made by the authors (abs. in *Phytopathology*, 38, p. 25, 1948). The spores were fixed to the slides by repeated wetting and drying, then placed in Coplin jars containing distilled water and incubated at 40° C. for eight hours. The slides were then inverted over a water surface, and by the end of five days several had germinated, giving rise to long promycelia with a whorl of three to four sporidia typical of the Tilletiaceae. The nuclear cycle of the chlamydospores of *U. agropyri* was also similar to that of other related species, e.g., *U. occulta* [*R.A.M.*, 14, p. 30] and *Cintractia montagnei* [ibid., 1, p. 151]; within the host, mycelium and spore formation proceeds as in *U. occulta*. The mature spores were composed of one to three fertile cells surrounded completely by hyaline to pale cinnamon-yellow sterile cells. Cultures of *U. agropyri* were obtained from germinating chlamydospores transferred aseptically to potato dextrose or malt agar. The growing colonies were smooth, glistening, and flat, without well-developed aerial mycelium: between 20° and 24° the colony presented a marked counter-clockwise spiral contour. In several of the sectors evident in culture, a large number of uninucleate hyphae were found associated with the characteristic dikaryotic mycelium, as described for several other smuts, e.g., *Ustilago longissima* [ibid., 3, p. 101], *U. hordei* and *U. kolleri* [ibid., 6, p. 309], *U. zeae* [*U. maydis*: ibid., 8, p. 715], and *U. striiformis* var. *agrostidis* occurring on the same host. The ovate-ellipsoid, hyaline, thin-walled sporidia produced as sectors in the cultures of the dikaryotic hyphae developed rapidly by yeast-like budding. No intersporidial conjugations were obtained, but at a temperature range of 20° to 24° several mycelial sectors reappeared.

Merrill (T. A.). **A system aiding diagnosis of nutrient deficiencies in fruit trees.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 48–50, 2 figs., 1948.

Based on the pressure injection system [*R.A.M.*, 25, p. 111] the author developed an apparatus for direct injection of nutrients into the phloem tissue of fruit trees. Possible causes of nutrient deficiencies can be determined by treating single branches.

The liquid is contained in a 5 gal. pressure tank provided with a valve and pressure gauge. The outlet tube, running from the bottom out through the top of the container, is fitted with four valve couplings welded to a brass tee; to each valve is attached 10 feet of $\frac{3}{8}$ in. tubing. At the end of each tube a brass compression coupling is used and the tubing is securely fastened to the injection needle. Air pressure is obtained from a small petrol-engine air compressor. Complete nutrient solutions at concentrations up to five times the normal strength were taken readily

by all trees injected, but those ten times the normal strength were unsatisfactory. Injections made at 100 lb. pressure required 15 to 40 minutes per gal.

Sprau (F.). **Lagerschäden an Kernobst.** [Storage damage to pome fruit.]—*Pflanzenschutz*, 1, 2, pp. 11–14, 2 figs., 1948.

This is a semi-popular account of the damage sustained by pome fruit (especially apples) in storage in Bavaria through fungal diseases due to *Monilia* [*Sclerotinia*] *fructigena*, *Fusicladium dendriticum* [*Venturia inaequalis*], *Fusarium herbarum* [*R.A.M.*, 16, p. 243], *Gloeosporium album* [*Glomerella cingulata*], *G. fructigenum* [*Glomerella cingulata*], *Trichothecium roseum*, *Botrytis cinerea*, and *Penicillium glaucum*, and non-parasitic disorders, including bitter pit, glassiness [ibid., 15, p. 663], and internal breakdown. Preventive measures are indicated, based on rational orchard practices and the provision of proper storage conditions.

D'Oliveira (B.) & D'Oliveira (Maria de L.). **Nota sôbre os corpos *M* do tricoginio e do anteridio nas Venturia inaequalis, V. pirina e V. eriobotryae.** [Note on the *M* bodies of the trichogyne and of the antheridium in *Venturia inaequalis*, *V. pirina*, and *V. eriobotryae*.]—*Agron. lusit.*, 8, 4, pp. 291–301, 5 pl., 1946. [English summary. Received July, 1949.]

As a result of studies carried out in Portugal from 1928 to 1932 and at Cambridge, England, in 1933–4 on *Venturia inaequalis* [*R.A.M.*, 21, p. 208], *V. pirina* [ibid., 21, p. 460], and *V. eriobotryae* [the ascigerous state of *Fusicladium dendriticum* var. *eriobotryae*: ibid., 9, p. 687, *et passim*], the authors describe the cytology of the primordial stages of perithecial formation from the appearance of the trichogyne and the antheridium to the end of the conjugation process and the disappearance of these organs. The so-called '*M*' or motile bodies observed in the antheridial and trichogyne cells of living cultures are specially active before and during fertilization and may exert a determining action on the process.

Chamberlain (G. C.). **Three years' spraying experiments for control of Apple scab in the Niagara Peninsula.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, p. 13, 1949.

During the past three years investigations have been carried out at St. Catherines in the Niagara Peninsula on the efficacy of 34 fungicidal treatments for the control of apple scab [*Venturia inaequalis*]. The results demonstrated the importance of the elemental sulphur fungicides and their particle size, of timeliness of application in respect to critical infection periods, the need of renewing coverage after periods of excessive weathering, and the advisability of making application at intervals of 7 to 10 days, especially through the period from the pink bud stage to the first cover spray [see above p. 441].

In wet weather the addition of spreader-adhesives to the dry sulphurs improved scab control. Fermate and phygon were found to be effective, while methasan and dithane caused conspicuous foliage injury. Puratized agricultural spray was effective as an eradicant, but appeared to lack protective value.

Najjar (H.). **Apple scab.**—*Circ. Ext. Serv. Minist. Agric. Syria* 37, 11 pp., 3 figs., 1949. [Arabic, with English summary.]

In Syria apple scab [*Venturia inaequalis*: ? a new record, see C.M.I. map No. 120] occurs sporadically, attaining serious proportions in years when spring months are wet. Certain indigenous apple varieties are particularly susceptible. Control methods are described.

Blumer (S.) & Bieri (F.). **Schorfbekämpfungsversuche 1948.** [Scab control experiments, 1948.]—*Schweiz. Z. Obst- u. Weinb.*, 58, 1, pp. 16–23, 1949.

In 1948, when weather conditions in Switzerland favoured the development of

apple scab [*Venturia inaequalis*: *R.A.M.*, 28, p. 324], it was clearly apparent that the number of primary infections from ascospores is of much less importance in dissemination than the weather at the decisive periods.

The addition of copper oxychloride to the regular lime-sulphur spray schedule is recommended by the Wädenswil Experiment Station. It should be used at a dosage of 1 per cent. for an early pre-blossom treatment, then reduced to 0·2 per cent. and for the two post-blossom treatments (when the trees are highly sensitive to copper injury) to 0·1 per cent. For the late scab applications the dosage may again be increased to 0·15 or 0·2 per cent. Copper oxychloride may also be used as an adjunct to wettable sulphurs, e.g., thiovit [ibid., 27, p. 369], which proved to be both equally effective with lime-sulphur in the control of the disease and quite as injurious to sulphur-sensitive varieties. The latter may be treated with the thiuram preparations, fungicide Grisard, organol, pomarsol, and tiurax. Not only did the results of the 1948 tests emphasize the need for the use of the best preparations available for scab control, but they revealed the equal importance of correct timing of the sprays.

Blumer (S.) & Lüthi (E.). **Der Apfelmehltau und seine Bekämpfung.** [Apple mildew and its control.]—*Schweiz. Z. Obst- u. Weinb.*, 58, 1, pp. 23–25, 1 fig., 1949.

Apple mildew (*Podosphaera leucotricha*) has been very prevalent of recent years in east and central Switzerland [*R.A.M.*, 28, p. 324], where its control is an urgent problem. Of 183 varieties cultivated at the Wädenswil Experiment Station, only 41 (22·4 per cent.) were found to be free from the disease at an inspection on 18th July, 1948, while the degree of infection was rated as mild in 69 (37·7 per cent.), fairly severe in 43 (23·5), severe in 22 (12), and very severe in eight (4·4). Of the commercially important varieties, Glockenapfel and four types of pippin (grey Canada, Champagne, Baumann's, and Ananas) were immune; Boskoop, Danziger Kant, Winterzitrone, Sauergrauech, Golden Delicious, Freiherr von Berlepsch, Menznauer-Jäger, and Bohnapfel slightly susceptible; Ontario, Klarapfel, Blenheim Golden Pippin, Weisser Winterkalvill, Bismarck, Berner Rosen, and Stäfner Rosen susceptible; and Boiken, Jonathan, Landsberger Pippin, Gravenstein, and Transparente de Croncels very susceptible.

In 1948 experiments on the control of *P. leucotricha* by spraying with wettable sulphurs were continued. In a Jonathan orchard one of the trees already treated in the same way in 1947 served as a control. It contracted 36·9 per cent. mildew in 1948, showing that one year's treatment does not suffice to eliminate infection, while the average incidence on the sprayed trees was 9·4 per cent. Tests with three wettable sulphurs on five heavily infected Boikens reduced the incidence of mildew from 48 to 18, 20·3, and 23·4 per cent., respectively.

It is apparent from these results that the disease can be combated up to a point with wettable sulphurs, but their use presents considerable difficulties in the case of the sulphur-shy varieties. Spraying alone is in any event inadequate for the complete elimination of *P. leucotricha*, and requires to be supplemented by thorough pruning. The diseased shoots are conspicuous in the summer, but even in the autumn and winter they may be recognized by the immaturity of the wood, while the bark of infected branches is usually somewhat shrunken and soft.

Mulder (D.) & Vlasveld (W. P. N.). **De invloed van de bespruitingen voor de bloei op de aantasting van Peren door schurft in 1947.** [The influence of pre-blossom spray treatments on scab infection of Pears in 1947.]—*Meded. Direct. Tuinb.*, 12, 4, pp. 192–196, 4 graphs, 1949. [English summary.]

The severe and protracted winter of 1946–7 in Holland delayed the main discharge of ascospores of pear scab (*Venturia pirina*) [*R.A.M.*, 27, p. 426] until shortly

before and during blossoming (24th April and 6th May). Many growers applied only one pre-blossom spray, omitting the second treatment on account of bad weather; this resulted in a heavy outbreak of the disease. Thus, of the 34 orchards given only one pre-blossom treatment, one was free from scab, 14 showed 10 per cent. infection, 11, 10 to 30 per cent., and 8, 30 to 80 per cent., the corresponding figures for the 22 sprayed twice being 14, 8, 0, and 0, respectively.

Pear fruits, which lose their pubescence early, were more severely attacked by *V. pirina* than apples [by *V. inaequalis*]. Primary scab lesions on pear fruits are believed to proceed directly from the ascospores, in contrast to the first spots on apples, which probably emanate from conidial infections on the young leaves [cf. ibid., **25**, p. 399].

The timing of warnings to growers, based on ascospore expulsion in relation to the phases of bud and blossom development [ibid., **28**, p. 220] is portrayed by means of graphs.

PALMITER (D. H.). **Sooty blotch disease of Pears and its control.**—*Bull. N.Y. St. agric. Exp. Sta.* 734, 14 pp., 1 fig., 1948.

This bulletin contains a summary of the results of experiments on the control of pear sooty blotch (*Gloeodes pomigena*); the information has already been noticed from other sources [see above, p. 446].

ATKINSON (J. D.). **Stony-pit of Pears.**—*N.Z. J. Sci. Tech.*, A, **29**, 6, pp. 291–295, 3 figs., 1948 (issued 1949).

Stony pit, a virus disease of pears [*R.A.M.*, **27**, p. 555], is widespread in New Zealand, but seldom affects many trees in any one orchard. The disease has probably been present in the country for at least 23 years, Cunningham's illustrations of fruit suffering from a condition described as bitter pit [ibid., **4**, p. 673] depicting typical stony pit symptoms. Natural infection has been observed on the Beurré Clairgeau, Packham's Triumph, and P. Barry varieties, and the disease has been transmitted by grafting to Beurré Bosc, Fertility, P. Barry, Winter Cole, and Winter Nelis, a total of 14 trees becoming infected out of 25 inoculated. The symptoms of stony pit in New Zealand consist of dark brown, necrotic, hard pits, from less than 1 mm. to 2 cm. or more in diameter, and often surrounded by greenish tissue; within the larger pits cavities, lined with dry, spongy, necrotic tissue, may be formed. Clearly defined lesions may develop in fruits not exceeding 1 in. in diameter, and such early infections are followed by severe distortion. The New Zealand symptoms agree closely with those described by Kienholz from the United States [ibid., **18**, p. 463] and Wallace *et al.* from England [ibid., **24**, p. 22], and are probably due to the same virus.

HARRIS (W. B.). **Peach blight, a die-back disease of Peach trees.**—*J. Dep. Agric. S. Aust.*, **52**, 9, pp. 422–424, 2 figs., 1949.

Peach blight [shot hole] caused by *Coryneum beijerinkii* [*Clasterosporium carpophilum*: *R.A.M.*, **27**, p. 75] has become increasingly important in South Australia during the past three years. During the present season it has caused severe damage entailing heavy losses in all the non-irrigated peach growing areas of the State, appearing for the first time in parts of the Barossa Valley. Hitherto damage has been important in South Australia only on apricots, almonds, and cherries.

Based on experience with shot hole in apricots [ibid., **22**, p. 470] and on recommendations issued in California, the spraying of peach trees with 6–4–40 Bordeaux mixture from $\frac{3}{4}$ leaf fall to the end of the season and in spring at the commencement of bud swell, is advised. If a dormant oil or tar distillate spray is required for the control of *Myzus persicae* it should be applied before the spring Bordeaux spray

as the two materials are not fully compatible. A compatible oil may be added to the mixture to improve its adhesive qualities.

Thomas (W.), Mack (W. B.), & Fagan (F. N.). **Foliar diagnosis : comparison of diseased and healthy leaves from the same tree in a Peach orchard infected with Bacterium pruni: nutritional factors in relation to bacterial leaf spot of Peach: the mineral nutrition of Peach trees with particular reference to bacterial leaf spot.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 179–182; 183–190, 3 graphs; 52, pp. 47–56, 2 graphs, 1948.

Foliar analysis [*R.A.M.*, 20, p. 431; 27, p. 424] of terminal growths of Sunhigh and Summercrest peaches, collected from an orchard in York County, Pennsylvania, in August, 1946, which were infected to varying degrees with *Bacterium* [*Xanthomonas*] *pruni* [ibid., 27, p. 413], indicated that diseased leaves were further advanced toward senescence than healthy ones; the higher the rate of infection, the greater was the reduction in nitrogen content. This evidence suggests that, in general, healthy leaves should be used as a basis of comparison in attempting to ascertain the nutritional conditions associated with resistance or susceptibility of plants to infection.

In the second paper the authors state that the potassium content increases with the severity of the disease symptoms, while that of calcium tends to decrease. The potassium oxide: nitrogen and iron: manganese ratios increased regularly with increased infection rate. An inverse relationship existed between the proportion of nitrogen in the composition of the nitrogen-phosphoric acid-potassium unit [loc. cit.] and the degree of infection. It is concluded that infection is related to low vigour resulting from a low proportion of nitrogen associated with insufficient organic matter in the soil of the orchard.

In the third paper studies are reported on the effect of differential fertilization with muriate of potash during the two preceding seasons, in addition to uniform, fairly adequate applications of complete commercial fertilizer on Hale, Sunhigh, and Goldeneast peach trees in a commercial orchard infected in varying degrees by the pathogen. Defoliation caused by *X. pruni* was inversely related to vigour, which in turn was directly related to yield. No consistent relation was found between the potassium content of the leaves and the potassium applied, although leaves from the most vigorous tree, which was the least affected, had the highest potash content at the first sampling and leaves from trees of low vigour had a low potash content. Generally, the vigour and yield of the trees were found to be directly related to the intensity of nutrition.

Baker (C. E.). **The effectiveness of some organic mulches in correcting potassium deficiency in Peach trees on a sandy soil.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 205–208, 1948.

Mulches of [farmyard] manure, straw, and soy-bean hay (in decreasing order of efficacy) applied in a 4 in. layer over a circle 8 ft. in diameter around peach trees growing on sandy potassium-deficient soil in northern Indiana in 1946, effectively eliminated symptoms of potassium deficiency.

Bullock (R. M.) & Benson (N. R.). **Boron deficiency in Apricots.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 199–204, 4 figs., 1948.

During recent years apricot fruits in the Wenatchee area of Washington have developed malformations due to boron deficiency [*R.A.M.*, 21, p. 209], which made the crops unmarketable. The affected fruit exhibited internal browning and cork formation especially near the stone, dry, corky cracking, and surface shrivelling with browning and constrictions. The boron content in deficient fruit ranged from 9 to 18 p.p.m. and in leaves from 32 to 50 p.p.m. Normal fruits contained 30

p.p.m. Soil applications of borax at ½ lb. per tree eliminated all symptoms and increased the boron content of fruits up to 150 p.p.m. Necrotic spots developing on fruits under natural conditions were shown to be associated with excess boron content (205 p.p.m.).

Willison (R. S.). **Some observations on Cherry viroses in Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, p. 13, 1949.

A survey in the early summer of 1947 of 26 widely scattered sweet cherry plantings in the Niagara fruit belt, Ontario, revealed that in 24 of the blocks the incidence of tatter leaf [see above p. 442] ranged from 0·6 to 41·3 per cent. The proximity of sour cherries had apparently no relation to the occurrence of the disease. Mottling, with and without ring patterns, was also prevalent. In eleven orchards about 10 per cent. of trees showed necrotic leaf spots of undetermined etiology.

Cherry yellows [loc. cit.] was found in each of the 32 blocks of sour cherries inspected, the incidence varying from 2·6 to 78·2 per cent. Some trees diagnosed as infected in 1945 showed no symptoms. The 'bare wood', willowy branch effect, generally considered as a symptom of long-standing infection, was not always significantly correlated with the presence of foliage symptoms.

The incidence of necrotic ring spot on sour cherries [loc. cit.] varied from 0 to 73·7 per cent. The chronic symptoms are usually suppressed or inconspicuous. New infections, expressed by acute or 'shock' symptoms, were observed in 14 orchards, in ten of which 0·3 to 3·8 per cent. of the trees were affected. Such orchards and most of those showing only mild symptoms are considered to have almost reached the saturation point. The four orchards in which 10·8 to 25·7 per cent. of trees exhibited severe shock symptoms appear to be in the intermediate stages of invasion and to have considerable numbers of healthy trees.

Richards (B. L.), Hutchins (L. M.), & Reeves (E. L.). **The western 'X' virus a cause of 'little Cherry' in Utah.**—Abs. in *Phytopathology*, 39, 1, p. 19, 1949.

Transmission experiments during the last two years have established the fact that 'little cherry', as it occurs in Utah [*R.A.M.*, 28, p. 408], is an expression of the western-X virus [? a strain of peach X-disease virus] in sour and sweet cherries on mazzard rootstocks. When buds and fruit spurs from sweet and sour cherry trees with 'little cherry' symptoms are grafted into peach, typical symptoms of western X-disease develop; when grafted into sweet and sour cherries on Mahaleb [*Prunus mahaleb*] the characteristic features of wilt and decline are produced; and when grafted into *P. virginiana* and *P. demissa* western X-disease, red leaf, and 'little cherry' fruit symptoms appear. The results of the present experiments with 'little cherry' inoculum parallel in every respect those obtained in previous years with the western X-virus inoculum both from the peach and the two last-named *Prunus* spp. 'Little cherry' fruits, rosetted leaves, and stipule proliferation and persistence also developed in sour cherry on mazzard roots grafted with buds and fruit spurs from sweet or sour cherry trees affected by 'little cherry'.

Taylor (C. F.). **Benefits from the control of leaf spot on sour Cherry.**—*Proc. W. Va Acad. Sci.*, 19, 8–1, pp. 19–22, 1949.

This information has already been noticed from another source [*R.A.M.*, 27, p. 570].

Gray (Elizabeth G.). **An interesting disease of Gooseberries.**—*Gdnrs' Chron.*, Ser. 3, 125, 3256, p. 198, 2 figs. (1 on p. 197), 1949.

The symptoms of a hitherto unrecorded disease of gooseberries were first observed about 20 years ago in the garden of Brodie Castle, Morayshire. Although obviously

affected plants were removed, the disease continued to recur on bushes of all ages. Little new wood was produced and the young twigs, which were short and spindly, arose in clusters. The leaves were mostly less than $\frac{1}{2}$ in. in width, yellowish-green in colour, deeply lobed, and with the margin only slightly crenate. The flowers, which were normal in size and appearance, were very numerous, but the few fruits produced were small and often shrivelled. Whinham's Industry, Langley Green, Langley Gage, and Leader were among the varieties attacked. Spraying, liming and cutting out affected wood failed to give any control.

In May, 1944, the disease was confined to about nine or ten bushes in adjoining rows, in the centre of a bed of about 50 bushes. By 1945 several of the affected bushes were dead and there were signs of the disease on the outermost bushes of the bed. By 1948, all the bushes in the bed were affected and the majority had died.

In autumn, 1945, diseased twigs were grafted on to healthy young gooseberry and black currant bushes at the North of Scotland College of Agriculture, Craibstone, near Aberdeen. Many observers have noted the resemblance between the gooseberry disease and reversion [virus] in black currants [*R.A.M.*, 16, p. 822]. In 1946, the twig adjoining the graft in one gooseberry bush produced small leaves of the type found at Brodie Castle. By April, 1949, the bush was severely affected, indicating that the disease is of virus origin. Grafting has not yet produced any reaction in black currants and there is as yet no evidence that the cause of the two diseases is the same. A condition similar to the Brodie disease was observed at Pitfodels (Aberdeen) and Helmsdale in 1945, and at Achnashellach (Ross-shire) and Kirkwall in 1948.

Horn (N. L.) & Woods (M. W.). **Transmission of the mild streak virus of Black Raspberry.**—*Phytopathology*, 39, 5, pp. 377–385, 2 figs., 1949.

Black raspberry mild streak [? a strain of the raspberry streak virus: *R.A.M.*, 27, p. 374] proved to be graft-transmissible from diseased Cumberland and Logan to healthy Logan, Dundee, and hybrid (Cumberland × Evans) in 43 out of 55 tests at the Maryland Agricultural Experiment Station. The symptoms developed within a period ranging from 39 to 103 days. Transmission was further effected in 8 out of 30 tests by grafting with dodder (*Cuscuta subinclusa*) [ibid., 26, p. 521], using a simplification of Cochran's technique (abs. in *Phytopathology*, 36, p. 396, 1946; 37, p. 5, 1947), the symptoms appearing after 54 to 67 days. The virus nature of the disease is now regarded as established. Three insects tested did not act as vectors, nor was transmission obtained by the mechanical inoculation of healthy black raspberries with freshly expressed sap of mild streak-diseased plants.

Wilson (E. E.) & Miller (H. N.). **Olive leaf spot and its control with fungicides.**—*Hilgardia*, 19, 1, pp. 1–24, 3 figs., 1 diag., 2 graphs, 1949.

Olive leaf spot [*Cycloconium oleaginum*: *R.A.M.*, 26, p. 160 and next abstracts] has been known in California for over 50 years but received little attention until the recent outbreaks. The first symptoms are inconspicuous, sooty blotches on the leaf blade which develop, on the upper surface only, into the typical dark green lesions [ibid., 23, p. 137]. These are notably more abundant on foliage in the lower parts of the trees. Many of the twigs in these parts become completely defoliated and frequently die. Less severely infected leaves which remain on the tree bear inconspicuous, circular spots with greyish surfaces. In late October and November these spots may double their size within a few weeks, this lesion expansion being an important phase in the life cycle of the fungus.

Of the principal olive varieties in California, Mission was most commonly affected and Manzanillo occasionally. Only a few obscure lesions were found on Sevillano, Barouni, Ascolano, and Nevadillo.

Since 1941, outbreaks of the disease have reduced the productiveness of some trees probably by as much as 20 per cent. In one orchard defoliation resulted in the death of between 10 and 20 per cent. of the fruiting wood of some trees. Older leaves were found to be more susceptible to attack than young ones.

The conidia, measuring 14 to 27 by 9 to 15 (average 21 by 11) μ are elongate-ovoid to pyriform, one- or two-celled, greenish-yellow to yellowish-brown on short, globose conidiophores which arise from the subcuticular mycelium. The spore wall is smooth at first, later becoming somewhat thickened and rough. When mature the conidia are readily detached from the conidiophore by water. The mycelium is composed of a thin layer of hyphae beneath the cuticle of the upper leaf surface.

The fungus was isolated by transferring single ungerminated conidia to solid media, but growth was slow. Only three of many isolates produced conidia in culture. Conidia germinated and the mycelium grew between 9° and 30° C., the optimum being 16° to 20°. After two to three weeks on olive-leaf extract agar, the most favourable medium, the colony appeared macroscopically as a dark, olive brown spot, later becoming hemispherical with a greyish-olive, felt-like surface. The colour of the colony varied from jet black at 9° to grey at 20°.

During the hot, dry, summer months the fungus survives as mycelium in diseased leaves on the tree; and these provide an important source of conidia for new infections, the number of conidia produced depending on the time of year; few viable ones are found during summer or early autumn. During October or November, however, the lesions begin to expand and by late November bear abundant conidia. The incidence of leaf infection diminishes rapidly as horizontal distance from the source of infection increases. Possibly at least some of the conidia are disseminated from tree to tree in wind-blown droplets of water spattered from lesions. The downward dissemination of spore laden droplets may account for the greater prevalence of the disease on the lower than on the upper parts of the tree.

The fungus appears to enter the olive leaf at various times in autumn, winter, and spring. Variations between the length of the incubation periods in winter and spring may reflect the effect of temperature on fungus growth. Affected leaves become yellow and fall during May and June.

In spraying experiments Bordeaux mixture (8–8–100 or 10–10–100) applied in autumn or early winter effectively prevented leaf infection between 1944 and 1947, later applications giving less satisfactory control. For example, treatment on 26th November, 1946, reduced leaf infection by 98 per cent., whereas treatment on 21st January, 1947, reduced infection by only 44 per cent. In the 1943–44 and 1944–45 seasons two treatments of 8–8–100 Bordeaux proved more effective than a single treatment, application on 18th December, 1944, and 13th January, 1945, reducing infection by 91 per cent. compared with 75 per cent. and 67 per cent. for sprays on each date alone. In the next two seasons, however, one November treatment of 10–10–100 Bordeaux gave adequate protection. On the whole, proper timing of the Bordeaux treatment seemed more important than renewing the fungicide deposit. Ferric and zinc dimethyl dithiocarbamate (fermate and zerlate) were not so effective as Bordeaux. Yellow cuprous oxide (3–100) controlled leaf spots but injured the leaves. Three per cent. lime-sulphur was as effective as 10–10–100 Bordeaux, but its protective qualities were less lasting. The effects of treatments were sometimes observed to persist for more than one year.

Miller (H. N.). **Development of the leaf spot fungus in the Olive leaf.**—*Phytopathology*, 39, 5, pp. 403–410, 2 figs., 1 diag., 1949.

The author's histological studies of the lesions of *Cycloconium oleaginum* on olive leaves [see preceding and next abstracts] in California revealed a layer of inter- and intracellular mycelium (one hypha thick) in the outermost layer of

epidermal cells [*R.A.M.*, 5, p. 16]. Along it arise short hyphal branches, which grow through the cuticle to the leaf surface and produce single, uni- or bicellular conidia. The fungus grows slowly during the early summer, the mycelium ramifying through the foliar tissue and between the cells of the inner epidermal layer but forming no conidia. In the autumn some of these inactive lesions expand and produce spores on their margins, while others, of more recent date, do not enlarge but become active and give rise to conidia over their entire surface. The pathogen remains alive and continues to grow profusely as a saprophyte in the tissues of fallen leaves, producing conidia for some time. No perfect state of *C. oleaginum* was found during these investigations, but stromatic bodies associated with the fungus were detected in dead leaves bearing old lesions. Infection and lesion development may occur in California at any time during the autumn, winter, and early spring when moisture and temperature conditions are propitious, as shown by Wilson and Miller [see preceding abstract].

Baldacci (E.). **Osservazioni sopra alcune malattie crittogamiche dell' Olivo in Sicilia.** [Observations on some fungal diseases of Olive in Sicily.]—Reprinted from *Olearia, 1948*, 8–9, 6 pp., 5 figs., 1948.

In these notes on olive diseases in Sicily the author states that knot disease (*Bacterium* [*Pseudomonas*] *savastanoi*) [*R.A.M.*, 25, p. 508] is most prevalent in windy places, especially those near the sea. Incidence is increased by the careless removal of branches, the practice of beating the trees, hailstorms, and unskilful pruning and neglect to disinfect the wounds.

In leaf spot (*Cycloconium oleaginum*) [see preceding abstracts] the fungus is confined to the cuticular layers of the epidermis, where it acts upon the pectins by means of enzymes. This enzymic activity is most vigorous when the leaves contain ample amounts of water, and conversely. During the first phase of penetration, however, the fungus is most aggressive when the leaf tissues contain very little water; but during invasion of the tissues it is favoured by the presence of water. This explains why the disease occurs particularly in groves exposed to the north, in cool valleys, and on irrigated land, while it is absent from or uncommon in situations facing south and high, open places. Severity of attack is also affected by the amount and frequency of the rains.

Sooty moulds and lichens are very common on olives and may be successfully combated by the application after harvest of superelgetol plus ferrous sulphate as sticker.

Macrophoma dalmatica [ibid., 27, p. 349] is stated to be very common and a *Botrytis* yielding small, black sclerotia in culture was isolated from one case of wilting.

Jensen (D. D.). **Papaya virus diseases with special reference to Papaya ringspot.**—*Phytopathology*, 39, 3, pp. 191–211, 3 figs., 1949.

Much of the information on papaw ring spot in Hawaii [see next abstract] contained in this paper has already been noticed from another source [*R.A.M.*, 27, p. 431]. The stage of fruit development at the time of infection determines the type of symptom. Fruits inoculated while young exhibit yellow rings at maturity, while those two-thirds grown display only uniform yellow spots. Water-soaked spots and streaks sometimes develop on the stems of young plants growing slowly at the time of inoculation. The ring spot virus moves rapidly upwards through the branches and main stem of the plant, symptoms appearing typically in the terminal foliage 13 or 14 days after inoculation on the mature leaves. Only two plants were available for tests on the rate of downward movement of the virus, which appears to be slower than the upward, 38 and 44 days elapsing between inoculation and symptom development. Negative results were obtained in

experiments on the transmission of the papaw ring spot virus by *Myzus persicae* to 16 other species of plants representing 12 families. Equally unsuccessful were attempts to convey to papaw eight virus diseases of other hosts in the Territory.

Jensen (D. D.). **Papaya ringspot virus and its insect vector relationships.**—*Phytopathology*, 39, 3, pp. 212–220, 1949.

Myzus persicae, the most common insect on papaw in Hawaii, is the principal vector of the ring spot virus [see preceding abstract], which is also transmitted by *Aphis gossypii*, *A. medicaginis*, and *A. rumicis*. *Macrosiphum solanifolii* and *Micromyzus formosanus* also are probably carriers of the disease, but the tests with these species were too few to be conclusive. *Myzus persicae* acquired the virus in a feeding time of two minutes and infected healthy plants after feeding on them for five minutes. No period of latency of the virus could be demonstrated in the aphid vector, nor did the latter retain the infective principle beyond the first healthy plant fed upon after transfer from a diseased one. Groups of 150 to 200 *M. persicae* induced ring spot in all the test plants after transfer from plants showing symptoms for only ten days. Similar numbers of aphids transmitted the disease to only 53 per cent. of the test plants after transfer from plants which had been infected for three months. The aphid failed to transmit the ring spot virus from diseased fruits.

Reid (W. D.) & Brien (R. M.). **A further report on grease spot of Passion-Vine.**—*N.Z. J. Sci. Tech.*, A, 29, 6, pp. 306–308, 1948 (issued 1949).

Further trials on the control of passion fruit grease spot (*Phytomonas* [*Pseudomonas*] *passiflorae*) by four applications of Bordeaux mixture (6–8–100 plus agral 3–100) [cf. *R.A.M.*, 24, p. 459; 27, p. 116] were conducted at the Department of Scientific and Industrial Research, Wellington, New Zealand, during the seasons of 1945, 1946, and 1947, cuprox 5–100 being included for comparison in the last year. In 1945, 10 per cent. of the fruit was infected at the time of the first spraying on 29th March and there was no further increase during the season. In 1946 the incidence of grease spot was 2·3 per cent. In 1947 Bordeaux- and cuprox-treated and unsprayed vines bore 1·2, 2·4, and 42 per cent. diseased fruits, respectively, at the final examination. Cuprox caused some injury to the foliage and is not recommended as a substitute for Bordeaux. The fruit yields of the vines used in the experiments for 1943, 1944, 1945, and 1947 were 85, 123, 87, and 132 per vine, respectively, showing that the yields of vines, now over six years old, were being maintained. On the basis of these trials, early March is recommended as a more suitable date for the commencement of spraying than the middle of the month.

Sinha (S.). **On the pathogenicity of certain fungi attacking Mango fruits in storage.**—*J. Indian bot. Soc.*, 27, 2–3, pp. 105–110, 1948.

In further studies at Lucknow on the pathogenicity of certain fungi to stored mango fruits [*R.A.M.*, 23, p. 347], *Aspergillus niger* was found to cause the maximum daily amount of decay at 30° C., followed by *A. nidulans* and *Acrothecium* [*Curvularia*] *penniseti*. First and second early and late fruits of the Safeda variety attacked by *A. niger* lost an average daily weight of 2·02, 3·57, and 3·88 gm., respectively, the corresponding figures for Bambai being 3·31, 4·29, and 6·21 gm., respectively. The daily reductions in Safeda infected by *A. nidulans* were 0·92, 1·18, and 1·45 gm., respectively, while late fruits of this variety and Bambai invaded by *C. penniseti* lost 0·68 and 0·92 gm., respectively. At 15° *A. nidulans* daily reduced the weight of early and late Safeda by 0·295 and 0·617 gm., respectively, the corresponding figures for *Acrothecium penniseti* being 0·29 and 0·74 gm., respectively. The latter species also reduced the weight of early and late Bambai by an average of 0·38 and 0·86 gm. per day, respectively.

Colletotrichum capsici caused a slight loss in the late fruits of Safeda and Bambai (0·301 and 0·33 gm., respectively), at 15° only.

Zäch (C.). **Ueber chemisch-physikalische Eigenschaften von Netzschwefelpräparaten.** [On the chemico-physical properties of wettable sulphur preparations.]—*Schweiz. Z. Obst- u. Weinb.*, 58, 1, pp. 25–27, 4 figs., 1949.

Data are presented and discussed relating to the physico-chemical properties of five brands of wettable sulphur tested in Switzerland in 1948 for apple scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*] control [see above, p. 461]. The colour of the preparations ranged from pale yellow to dark brown and their sulphur contents from 63·3 to 77·8 per cent. The pH values of the spray mixtures were mostly neutral to slightly alkaline (pH 7 to 8·5), while their wetting capacity (measured by the stalagmometer) varied within fairly wide limits (50 to 78). There was no apparent connexion between wetting capacity and efficiency. Suspensibility (represented by two numbers, indicating the proportions still in suspension after 15 and 30 minutes, respectively), ranged from 46/40 to 87/83 per cent.

Microphotographs revealed marked differences between the fineness of the individual particles in four brands of wettable sulphur (three used in these experiments and an older one intended for the vineyard). They were finest in preparation A (which also contained the maximum percentage of sulphur and attained the highest degree of suspensibility) and coarsest in the viticultural brand. The ideal particle size for orchard use has not yet been determined, since the enhanced efficacy associated with extreme fineness may be counterbalanced by an increased risk of scorching. In the writer's opinion it would be premature at this stage to fix minimal requirements for fineness and other physical properties in wettable sulphurs.

Goldsworthy (M. C.) & Gertler (S. I.). **Fungicidal and phytotoxic properties of 506 synthetic organic compounds.**—*Plant Dis. Reptr, Suppl.* 182, pp. 89–109, 1 fig., 1949. [Mimeographed.]

Of 506 synthetic organic compounds tested for their fungicidal effects on the conidia of *Monilinia* [*Sclerotinia*] *fructicola*, the causal organism of brown rot of peaches [*R.A.M.*, 27, p. 569] and *Glomerella cingulata*, the agent of bitter rot of apples [ibid., 27, p. 481], 47 were found to be toxic to the pathogens though mostly so slightly as to be of no value as fungicides; many of the compounds were toxic to the peach foliage. The 10 organic compounds which appeared to be the most promising as fungicides were the following: *p*-chloro-alpha-isonitroso-acetanilide, *p*, *p*′-thiodianiline, benzamide, benzimidazole, *p*-chloro-benzoic acid, 3,4-dichloro-benzoic acid, N-(*o*-methoxyphenyl)-glycinonitrile, 2,2′-methylenebis[4-chlorophenol], 2,2′-(2,2,2-trichloroethylidene)bis[4-chlorophenol], and 4,4′-isopropylidenediphenol. They possess satisfactory fungicidal properties, are stable in admixtures, and appear to cause no foliage injury to peach trees.

McGowan (J. C.) & Grove (J. F.). **Some applications of physical chemistry to the study of biologically active compounds.**—*Chem. & Indust., 1949*, 14, p. 221, 1949.

At the outset of this paper, presented at a joint meeting of the Nottingham section of the Society of Chemical Industry and the Fine Chemicals group on 10th to 11th March, 1949, reference was made to the value of studies of ultra-violet and infra-red absorption spectra in the characterization of certain biologically active substances, such as gliotoxin [*R.A.M.*, 26, p. 349], viridin [ibid., 27, p. 203], palitanin, and griseofulvin [ibid., 28, p. 232], isolated in small amounts from soil fungi. Many mould products are powerful and selective fungicides, the toxicity of

which often bears no relation to their chemical constitution but can be co-ordinated with their physical properties. It has been found, for instance, that although diverse chemicals exert the same toxic effect on a given organism at widely different concentrations, for each chemical the ratio of the toxic concentration in a certain phase to the concentration required to saturate that phase lies within a relatively narrow range. According to Ferguson (*Proc. roy. Soc.*, B, 127, p. 387, 1939), if the ratio lies between 0·1 and 1 a physical mechanism is probably operating, while if it is below 0·1 toxicity of a chemical nature is indicated.

Distinctions between toxicities of the chemical and physical type were most clearly shown by compounds in homologous series. With physically toxic substances the equitoxic molar concentration of any one member of the series is often about three times that of the next higher homologue. Beyond a certain molecular weight, however, the compounds are inactive owing to the insufficient concentration of their saturated solutions or vapours for the manifestation of biological activity. Examples cited of progressive physical toxicity in homologous series include the fungicidal activities of aliphatic alcohols, alkyl iodides, and aliphatic carboxyl acids, the influence of the test organism on the result being emphasized. In homologues of chemical rather than physical toxicity, all members of the series are either equally active or become decreasingly toxic as they ascend. Fungistatic activity among ethylenic compounds appears to depend on the presence of a substituent with a strong attraction for electrons. Thus, all the compounds containing the dioxazole (C=CNO_2) grouping are powerful fungicides, the vinyl sulphones less so, and in compounds having attached to the ethylenic bond an organic ester, carbonyl, organic acid, or aldehyde grouping, activity is still further reduced. Fungistatic activity is enhanced if a thiocyano group or a chlorine or bromine atom is attached to the ethylenic bond in addition to the electron-attracting group. High fungistatic activity in certain iodine compounds, e.g., di-iodoacetylene, tetraiodoethylene, and dimethyl iodofumarate, appears to be due to their ability to yield 'positive iodine' freely. Organic anions do not seem to penetrate fungi readily, and examples of the differences in toxicity between ions and undissociated acids and bases are discussed.

In cases of chemical toxicity the concentrations of the cell constituents are involved and sometimes even their nature is unknown, so that many of the data required for the application of chemical kinetics are not available. Limited conclusions, however, can sometimes be drawn. The reactivity of a series of compounds undergoing one type of reaction is governed by steric and electronic effects classified as inductive and electromeric. The toxicities of groups of compounds where inductive effects were varied without the introduction of electromeric or steric effects will sometimes indicate the site and type of chemical reaction implicated.

McClellan (W. D.), Christie (J. R.), & Horn (N. L.). **Efficacy of soil fumigants as affected by soil temperature and moisture.**—*Phytopathology*, 39, 4, pp. 272–283, 2 figs., 1949.

At the Plant Industry Station, Beltsville, Maryland, the authors investigated the efficacy of larvacide (chloropicrin), D-D (dichloropropene-dichloropropane) [*R.A.M.*, 25, pp. 128, 361, *et passim*], dowfume G [ibid., 27, p. 305], and dowfume W-15 against *Heterodera marioni*, *Fusarium oxysporum* f. *callistephi* [*F. oxysporum* f. 6] the agent of aster wilt [ibid., 27, p. 23], and *Sclerotium rolfsii* at two soil moisture levels (7 to 10 and 17 to 20 per cent.) and six soil temperatures between 45° and 101° F.

Chloropicrin was most effective against all three pathogens at 98°. D-D failed to control either of the fungi, while dowfume G was non-toxic to the aster wilt pathogen but the viability of the sclerotia of *S. rolfsii* was considerably reduced after three days at 72°, 82°, or 98°, possibly in part by the intervention of antagoni-

stic organisms. Similarly, dowfume W-15 was ineffectual against *F. oxysporum* f. 6 but toxic to *S. rolfsii* after six days at the same temperatures as dowfume G.

In general, the fumigants were most effective in wet soils and were retained longest in those of the wet, low temperature series.

MILLER (H. J.). **Modifications of the slide-germination method of evaluating fungicides including the use of Venturia inaequalis and Phytophthora infestans.** —*Phytopathology*, 39, 4, pp. 245–259, 8 graphs, 1949.

Standardized procedures were developed for the use of *Venturia inaequalis* and *Phytophthora infestans* in slide-germination evaluations of fungicides (abs. in *Phytopathology*, 34, p. 1009; 37, pp. 15–16), and variations in the methods applicable to *Sclerotinia fructicola* and *Alternaria oleracea* [*A. brassicicola*] were devised [*R.A.M.*, 26, pp. 206, 497; cf. also 28, p. 132].

The fungicidal suspension (0·1 ml.) is placed in circles 1 sq. cm. in area drawn with a wax pencil on Pyralin slides. In this area 0·1 ml. spore suspension is placed on the dried deposit and the spores are incubated in a large culture dish. *S. fructicola* and *V. inaequalis* are grown on 10 per cent. malt agar at 18° to 20°, the latter being transferred after 10 to 12 days by a mass sowing of a sterile water suspension of conidia. *P. infestans* is grown on Lima bean agar for 10 to 14 days, and zoospores for germination are obtained by placing centrifuged sporangia at 12° for three hours in glass-distilled water less than $\frac{1}{2}$ in. deep. The maximum yields of *V. inaequalis* conidia were produced at 9° C. in 25 days and at 21° in seven. In this species the number of conidia removable with water decreased markedly with age. Zoospore production in *P. infestans* also decreased with the age of the culture.

Potassium citrate (0·001 per cent.) and sucrose (0·1 per cent.) are used in place of orange juice (which gave variable LD 50 values) for germination of centrifuged spore suspensions of all the fungi except *P. infestans*, which requires these nutrients at 0·005 and 2 per cent., respectively.

Nation-wide results with fungicides in 1948. Fourth annual report.—*Plant Dis. Reptr, Suppl.* 181, pp. 17–87, 1949. [Mimeographed.]

Following experiments conducted in 1948 in the United States, Canada, and Mexico, the Fungicide Committee of the American Phytopathological Society (Sub-Committee on 'Summation of the Performance of New Fungicides') gives in this report the following general appraisal of fungicides for seed treatment. Arasan is recommended for treating the seed of maize, flax, groundnut, rice, sorghum, soybean, sugar beet, and most vegetables; it controls wheat bunt [*Tilletia caries* and *T. foetida*: *R.A.M.*, 27, p. 358] but is not suitable for diseases of barley and oats; ceresan M for the seed of barley, oats, wheat, flax, sorghum, rice, cotton, sugar beet, and some vegetables; new improved ceresan for the seed of barley, oats, wheat, sorghum, flax, and sugar beet; cuprocide for the seed of rice, groundnut, and most vegetables; dow 9-B for the seed of cotton, groundnut, pea, rice and some vegetables; phygon XL for the seed of maize, rice, sorghum, wheat, sugar beet, groundnut, pea, bean, and most vegetables; and spergon for the seed of maize, rice, sorghum, wheat, groundnut, pea, bean, and most vegetables. Dithane D-14 and Z-78, neither of which was extensively tested, were effective against seed-piece decay in potatoes, while the latter combated onion smut [*Urocystis cepulae*: ibid., 27, p. 404] and *Fusarium* root rot [*F. solani* f. *phaseoli*: ibid., 26, p. 476] in beans. Formaldehyde remains still the most effective treatment against onion smut [loc. cit.]. Panogen, a recent introduction from Sweden [ibid., 27, p. 421], was effective for the seed treatment of barley, oats, wheat, and sorghum. Seedox was promising for cotton seed but requires more testing, R118-A for the seed of oats in Canada, and lunasan for wheat.

Viennot-Bourgin (G.). **Les champignons parasites des plantes cultivées.** [The parasitic fungi of cultivated plants.] Tome I: pp. xv+1–755, 370 figs., 1 graph; Tome II; pp. 757–1850, 347 figs., 2 graphs; Paris, Masson & Cie., Éditeurs, 1949. Fr. 6,000.

The first volume of this valuable and comprehensive text-book of fungi parasitic on cultivated plants in France and the French colonial empire covers Myxomycetes (pp. 1–19), Archimycetes (pp. 21–45), Phycomycetes (pp. 47–198), and Ascomycetes (pp. 199–755), while the second deals with Basidiomycetes (pp. 757–1260) and Fungi Imperfecti (pp. 1261–1598). The general treatment is to deal with each fungus separately. The name of the organism is followed by its synonyms. Its geographical distribution is given, together with the hosts it attacks. The symptoms it causes are described, and its development and manner of spread are fully dealt with. This is followed by practical recommendations for control. The bibliographical references (arranged alphabetically under authors) occupy 175 pages, and there is also a subject index.

Wallace (G. B.) & Wallace (Maud M.). **A list of plant diseases of economic importance in Tanganyika Territory.**—*Mycol. Pap., Commonw. mycol. Inst.*, 26, 26 pp., 1949.

This list of plant diseases of economic importance in Tanganyika Territory combines those already published [*R.A.M.*, 27, p. 158] with additions and amendments, and covers the period from 1925 to early 1948. Recent additions [cf. ibid., 28, p. 246] are placed in an appendix. The diseases, fungus, bacterial, virus, and non-parasitic, are listed together under the common names of the hosts, arranged alphabetically. An index of the fungi and bacteria is appended.

Wiehe (P. O.). **The plant diseases and fungi recorded from Mauritius.**—*Mycol. Pap., Commonw. mycol. Inst.*, 24, 39 pp., 1948.

This annotated list of plant diseases and fungi in Mauritius adds about 240 further records to Shepherd's list of 1937 [*R.A.M.*, 17, p. 295]. The diseases are listed under the botanical names of the hosts arranged in alphabetical order followed by their vernacular names, the common name of the disease being given, with its causal agent, reference number of herbarium specimens preserved, and locality where found; brief notes with control recommendations are added in the case of diseases of special economic importance. Collections made by the writer in Rodriguez and the Chagos Archipelago are listed in a separate section.

Moreau (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. II.** [The parasitic disorders of the principal colonial crops. Bibliographic review. II.]—*Rev. Mycologie, Suppl. colon.*, 13, 2, pp. 49–62, 1948. [Received April, 1949.]

In this second review [cf. *R.A.M.*, 28, p. 73] the author gives notes from the literature published in 1947 and 1948 on the principal diseases of citrus, pineapples, bananas, cacao, coffee, sugar-cane, cotton, rubber, dates, rice, and tea. A bibliography of 79 titles is appended.

Marchionatto (J. B.). **Directivas en la lucha contra las enfermedades de las plantas.** [Lines of approach to the control of plant diseases.]—*Rev. argent. Agron.*, 16, 1, pp. 29–32, 1949.

Some important contributions to the orientation of methods of plant disease control are summarized and classified under four headings, viz., (1) exclusion, defined as to prevent the establishment of the pathogen in a given area or its penetration into the plant; (2) immunization: to immunize the plant by genetic or

chemical procedures; (3) regulation: to regulate the environmental factors so as to preclude relations between the plant and the pathogen; and (4) therapy: to cure the diseased plants. The first line of approach is directed towards the pathogen, the second towards the plant, the third towards the environmental factors, and the fourth towards the host-parasite complex [cf. *R.A.M.*, 9, p. 469; 15, p. 594; 16, p. 113; 25, p. 173, *et passim*].

Moore (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 95–99, 1949.

In September, 1941, *Geum*×*Borisii* plants in a nursery bed at Harpenden bore dark olive brown blotches on the leaves. The irregular lesions, visible on both surfaces, were scattered, or spread in from the margins in a V-shape, and occasionally covered the entire leaf. They bore numerous epiphyllous, occasionally hypophyllous, immersed, later erumpent, subglobose, pale brown, thin-walled pycnidia measuring 130 to 190 (up to 300) μ in diameter. The hyaline, short, rod-shaped pycnospores measured 5 to 7 by 1·5 to 3 μ; they had rounded ends with a prominent guttule at each end. The fungus was identified as *Phyllosticta gei* Bres., but this in the author's opinion, is the same as *Zythia fragariae* [*Gnomonia* (?) *herbicola*: *R.A.M.*, 24, p. 24; 27, p. 462], which is considered to be the valid name, as *P. gei* Bres. is not a *Phyllosticta* and appears to be different from and antedated by *P. gei* Thüm.

Vine downy mildew (*Plasmopara viticola*) still appears to be rare in England, only two previous authentic records of it existing when it was found on an outdoor vine at Wye in 1926 [ibid., 6, p. 206]. The vine was cut off at ground level and destroyed. The rootstock, left intact, grew vigorously, but became infected in September, 1932, and was destroyed. At about the same date the fungus was also collected on *Vitis coignetiae* at Haslemere. In 1936 a very old outdoor vine at Wye, about 300 yards from the one infected earlier, became affected. In 1941, a substantial attack was observed on a Miller's Burgundy vine growing in the open at Wye on a house wall about a quarter of a mile away from the vines infected earlier. In 1947 *V. vinifera* var. *purpurea* at Yalding, Kent, developed infection and there was a fairly severe attack on a number of vines at Oxted, Surrey, in 1948.

Observations have shown that potato black heart [ibid., 27, p. 153], a disorder due to high temperature, may occur immediately after digging, or even while the tubers are still in the ground. Temperature is a controlling factor, though there is a close relation between the development of the condition, time of exposure to high temperature, and oxygen supply. The author observed the condition at digging time in the late summer of 1933 when the hottest and driest August for 30 years was experienced. In some tubers the whole central part was black, while others contained a small central cavity surrounded by a brown or black lining. On one farm the symptoms were known to have been present before digging. This pre-storage black heart was seen again in early August, 1938, in Sussex; the lifted tubers (King George) were found to have black centres after exposure to the sun over a week-end. The same condition occurred in August, 1947, in tubers which had been exposed to hot sun for two or three days after digging, but there was clear evidence also that in one instance at least they were affected when lifted.

Rademacher (B.). **Krankheiten u. Schädlinge im Acker- und Feldgemüsebau: ihre Erkennung und Bekämpfung.** [Diseases and pests in agriculture and market-gardening: their recognition and control.]—182 pp., 92 figs., 1 diag., Stuttgart (z. Zt Ludwigsburg), E. Ulmer, 1949. DM 6.50.

This useful manual is addressed primarily to the agriculturist of progressive outlook and to the adviser. Stress is laid, therefore, on the recognition and control of the diseases and pests enumerated, but sufficient information on their biology

has been included to facilitate the intelligent application of control measures. The work falls into four chapters, dealing with (I) the nature and importance of plant protection; (II) causes of the diseases and injuries of cultivated plants; (III) diseases and pests in agriculture and market-gardening; and (IV) control of plant diseases and pests in general.

Svalöf 1886–1946. History and present problems.—389 pp., 60 figs., 4 diags., 8 graphs, 7 maps, Lund, Carl Bloms Boktryckeri A.–B., 1948.

The sixtieth anniversary of the foundation of the Swedish Seed Association in 1886 afforded an opportunity for a survey of the experience, ideas, and work of the Plant Breeding Institute at Svalöf, and the editors, Å. Åkerman, O. Tedin, K. Fröier, and R. O. Whyte (Commonwealth Bureau of Pastures and Forage Crops, Aberystwyth), accordingly present a number of papers by different authors dealing with various aspects of the Association's activities. The main object of this interesting compilation is to promote international collaboration between scientific plant breeders, in which the Institute is eager to participate. Several of the contributions include references to breeding for disease resistance, e.g., 'Breeding of potatoes' by O. Tedin (pp. 135–147), in which it is stated that a new early variety, Eva, immune from wart disease (*Synchytrium endobioticum*), is being multiplied for marketing in 1949 or 1950; 'The breeding of root crops' by A. Joseffson (pp. 148–165); 'Natural selection and the breeding of cross-fertilizing plants' by G. Nilsson-Leissner (pp. 198–210); and 'Conditions of cultivation and breeding problems for cereals and herbage plants in Norrland' by E. Åkerberg (pp. 278–303). Each paper is followed by a bibliography of the relevant literature.

Buchwald (N. F.). **Ensartet Benævnelse paa Plantesygdomme og Skadedyr.** [Uniform terminology for plant diseases and pests.]—*Beretn. nordisk. Landbr-Kongr., 1947*, 2A, pp. 560–565, [? 1947. Received June, 1949].

Since the author's original proposal, made at the Scandinavian Agricultural Congress at Uppsala in 1938, for the compilation of a list of common names of plant diseases in the Norwegian, Danish, Swedish, and Finnish languages, a number of publications [which are cited] have appeared, and they should considerably facilitate this very necessary enterprise. It is hoped that the next congress may be presented with a draft of a joint Scandinavian list of common names on the lines, e.g., of the English 'List of common names of plant diseases' [*R.A.M.*, 24, p. 425].

Gregory (P. H.). **The operation of the puff-ball mechanism of Lycoperdon perlatum by raindrops shown by ultra-high-speed Schlieren cinematography.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 11–15, 1 pl., 1 fig., 1949.

The author describes spore discharge from the peridium of *Lycoperdon perlatum* and other puff-balls of a similar type, brought about by the impact of water drops from a pipette or by raindrops of 1 mm. diameter or more. Ultra-high-speed photographs showed that the puffs reach a height of over two centimetres and their velocity on emergence from the ostiole is about 100 cm. per second.

Willison (R. S.). **A method for preserving and mounting pressed leaves.**—*Phytopathology*, 39, 5, pp. 414–415, 1949.

The following is a simple and convenient method for the preservation and mounting of pressed diseased leaves without loss of colour and detail. When the leaves are thoroughly dried, a coat of medium-thin white shellac is applied with a camel's-hair brush to both surfaces, and the specimens placed to dry overnight on a sheet of waxed paper or a coarse wire mesh. The shellac restores the lustre and

colour of the leaf and imparts to markings and patterns a remarkably natural aspect. The leaves are then arranged on an adhesive sheet of glossy Permafilm (Denoyer-Geppert Co., Chicago) or similar preparation and covered with a duplicate sheet applied as directed by the manufacturer. Leaves in this mount are reasonably flexible and can be handled without risk of breakage. Mounts measuring $4\frac{7}{8}$ by $7\frac{3}{4}$ in. when trimmed can easily be attached to 5 by 8 in. filing cards.

Brian (P. W.), Curtis (P. J.), & Hemming (H. G.). **A substance causing abnormal development of fungal hyphae produced by Penicillium janczewskii Zal. III. Identity of 'curling factor' with griseofulvin.**—*Trans. Brit. mycol. Soc.*, 32, 1, pp. 30–33, 1949.

All strains of *Penicillium janczewskii* (from different sources), as determined by assay against *Botrytis allii* produced griseofulvin [*R.A.M.*, 28, p. 232], but not all strains of *P. griseofulvum*. Yields of griseofulvin from *P. janczewskii* can be approximately doubled by extracting the mycelium as well as the culture filtrate, yields of about 400 mg. per l. of culture medium having been so obtained. For optimum griseofulvin production a chlorine content of the medium corresponding to 0·005 to 0·01 per cent. potassium choride is required.

Thaysen (A. C.), Forsyth (W. G. C.), Thaysen (Ingrid), & Maugée (Marcelle). **Organisms producing antibiotics in tropical soils.**—*Nature, Lond.*, 163, 4152, p. 835, 1949.

Experiments being made at the Colonial Microbiological Research Institute, Port-of-Spain, Trinidad, using a technique similar to that of Stokes and Woodward [*J. Bact.*, 43, p. 253, 1942], have revealed that tropical soils [*R.A.M.*, 23, p. 447] harbour, besides actinomycetes, certain spore-forming and non-spore-forming aerobic bacteria which produce a surprisingly selective inhibition of the growth of other organisms. For example, a short rod discovered in Trinidad air produces a water-soluble, thermostable, and apparently non-toxic antibiotic which arrests the growth of all fungi and yeasts tested (over 40 species) and is often active in concentrations of less than 1 p.p.m. Peptone was found to be essential for the production of one antibiotic investigated and glucose and peptone for a second. It is proposed to extend the present study to cover tropical habitats other than soils.

Leonard (J. M.) & Blackford (Virginia L.). **Fungus-inhibitive properties of bromoacetamides.**—*J. Bact.*, 57, 3, pp. 339–347, 1949.

A group of new compounds, 26 N-alkyl α-bromoacetamides and 10 N-aryl α-haloamides have been assayed for their fungistatic activities, using *Aspergillus niger* (ATCC 6277) and *Trichoderma viride* (USDA T-1) as test organisms. Certain bromoacetamides, especially the N-phenyl and the N-alkyls in which the substituent contains four to ten carbon atoms showed a high degree of toxicity. The mono-N-substituted compounds were more active than the di-substituted; the primary alkyls more than the secondary; and the normal chains were more potent than the branched ones. Of the aromatic compounds, the simple N-phenyl derivative, bromoacetanilide, was most active.

T. viride almost invariably showed a graduated inhibition over a considerable concentration range, while with *A. niger*, on decreasing dosage, the inhibition level usually shifted abruptly from totality to a negligible value in the next concentration. The two organisms required the same dosages for total inhibition, *A. niger* being inhibited at the lower concentration levels.

The dosage response data indicate that the action of bromoacetamides is not attributable simply to the activation of bromine or to any other single mechanism.

Christensen (C. M.), Olafson (J. H.), & Geddes (W. F.). **Grain storage studies. VIII. Relation of molds in moist stored Cotton seed to increased production of carbon dioxide, fatty acids, and heat.**—*Cereal Chem.*, 26, 2, pp. 109–128, 7 figs., 1949.

During the past 20 years considerable evidence has accumulated to indicate that moulds are often a major factor in the spoilage and heating of moist stored seeds of various kinds [*R.A.M.*, 27, p. 417]. Whether cotton seed is included in this category has been questioned, e.g., by workers at the Southern Regional Research Laboratory, New Orleans (*Plant Physiol.*, 19, pp. 310–325, 1944; 21, pp. 506–521, 550–561, 573–587, 1946), although it is known to harbour a fairly rich internal flora of both saprophytic and parasitic species [*R.A.M.*, 25, p. 112], and the present work was accordingly undertaken to explore some aspects of the problem.

The mould population increased rapidly on and within seed (mostly un-delinted Stoneville) stored at relative humidities of 84 to 90 per cent. for ten days at 30° C., and in general, carbon dioxide and free fatty acid production rose at the same time. The peculiar structure of the seed coat enables the moulds to gain easy access, through a pore-like aperture filled only with thin-walled parenchyma cells, to the interior of moist stored cotton seed, where they grow vigorously and sporulate profusely without betraying their presence by any external symptoms. Fungicides applied to the outside of the seed did not prevent rapid mould growth and sporulation in the interior; entire kernels and hulls stored moist without a fungicide respired more quickly, had a higher fatty acid content, and bore a larger mould population than similar fractions treated with thiourea. The results of these experiments suggest that moulds, including *Penicillium* sp., *Aspergillus glaucus*, *A. ochraceus*, *A. candidus*, *A. versicolor*, *Glomerella gossypii*, and *Fusarium vasinfectum*, may play an important part in the deterioration of moist stored cotton seed.

Kanagy (J. R.), Seebold (R. E.), Charles (A[rbelia] M.), & Cassel (J. M.). **Deterioration of leather under optimum mildew-growing conditions.**—*J. Amer. Leath. Chem. Ass.*, 44, 5, pp. 270–282, 1 diag., 1 graph, 1949.

Mildew (mostly *Aspergillus niger* and *Penicillium* spp.) does not appear to be the direct cause of the loss in tensile strength of leather samples [*R.A.M.*, 27, p. 251] kept for eight months in a cabinet maintained at a temperature of 28° to 30° C. and at 95 to 100 per cent. relative humidity, i.e., under conditions simulating those prevailing on the islands of the South Pacific Ocean or in other tropical regions. The principal factor in the deterioration appears to be a combination of the effects of high temperature and high relative humidity, resulting in hydrolytic action. The extent of the latter depends on the pH of the leather, decreasing slowly with an increase in pH value from 3 to 5 and much more rapidly below 3. The action of the mildew removes fatty greases, thereby causing a decline in tensile strength and permitting closer contact between the water and the leather, but mineral oils are not affected and may, therefore, be preferable to organic oils for use in tropical regions to maintain flexibility.

Generally speaking, leather is benefited by treatment with a fungicide containing the following materials (in percentages by weight), conforming to the requirements laid down in U.S. Army Specification, Compound Leather Dressing, Preservative for Field Treatment: perchloroethylene 67, mineral oil, neatsfoot oil, and cyclohexanone 10 each, and paranitrophenol and pentachlorophenol 1·5 each [cf. ibid., 27, p. 535].

Meeuse (A. D. J.). **Schimmels in de wasserij.** [Moulds in the laundry.]—*Pamfl. Vezelinst. T.N.O.* 12, 11 pp., 6 figs., 1948.

This is a semi-popular account of the morphology and physiology of the moulds encountered in Dutch laundries, e.g., *Chaetomium globosum* and *Aspergillus niger*,

with a discussion of the conditions under which they produce unsightly blemishes on fabrics.

DEAN (J. D.). **Preserving Cotton fabrics in outdoor use.**—*Circ. U.S. Dep. Agric.* 790, 17 pp., 8 figs., 1948.

The author gives information on the properties, selection, and care of cotton duck and lighter fabrics for farm use and describes various protective treatments [*R.A.M.*, 28, pp. 74, 137, 188, *et passim*].

A good weather-resistant treatment for cotton fabric should protect it against water, sunlight, and mildew. For portable covers requiring a moderately soft and pliable finish the formulae recommended are (1) petrolatum 8½ lb., beeswax 1½ lb., dry earth pigment 5 lb., and mineral spirits 5 gals.; (2) petrolatum 8½ lb., beeswax 1½ lb., dry earth pigment 5 lb., copper naphthenate 1½ lb. (for a naphthenate containing 10 per cent. copper), and mineral spirits 5 gals.; (3) petroleum asphalt, medium-hard, 7½ lb., petrolatum 2½ lb., lampblack 1 lb., mineral spirits 5 gals., with which copper naphthenate may be incorporated. The amounts specified generally suffice to treat 50 to 75 sq. yds. canvas on one side. Formula 2 is recommended for use where severe mildew can be expected. For permanently fixed covers, where a stiff finish is not objectionable, the formulae recommended are (4) boiled linseed oil 1 gal., lampblack ground in linseed oil 2 lb., and Japan drier 1 pint, and (5) boiled linseed oil 1 gal., aluminium bronzing powder 1 lb., and Japan drier ½ pint.

In the summer of 1946, comparative tests were begun at New Orleans in which separate samples of 10-oz. army duck were exposed to the weather for 12 months after being painted on one side with formula 2 or 4 or with one of two commercial compounds, one (A) being of the type used for military purposes, while the other, (B), was a readily available commercial preparation. Climatic conditions during most of the test were highly favourable to the growth of micro-organisms, an untreated duck becoming so heavily mildewed that after six months it lost nearly 80 per cent. of its original breaking strength. Throughout the test the samples treated with formula 4 and A showed excellent strength retention and water resistance; formula 2 was superior to B in both respects (strength loss after 12 months for untreated control, formula 4, compound A, formula 2, and compound B being 92, 24, 21, 47, and 77 per cent., respectively). The last two treatments gave softer, more flexible samples than the others.

LINDEBERG (G.). **On the decomposition of lignin and cellulose in litter caused by soil-inhabiting Hymenomycetes.**—Reprinted from *Ark. Bot.*, 33 A, 10, 16 pp., 1946. [Received June, 1949.]

Continuing his studies at the University of Uppsala, Sweden, on the capacity of soil-inhabiting Hymenomycetes for the decomposition of lignin and cellulose in sterilized litter (beech foliage, straw, and *Glyceria maxima* leaves) [*R.A.M.*, 28, p. 320], the writer found that *Clavaria gracilis* attacked beech lignin with some intensity but did not decompose cellulose. The other 31 fungi disorganized both constituents, in most cases to a roughly equal extent, during the experimental period of 160 to 171 days. Four species, however, attacked lignin much more actively than cellulose, e.g., *Collybia butyracea* (lignin 76·5 per cent., cellulose 15·6).

In another series of tests, covering a period of 183 to 248 days, the percentages of total dry matter (beech leaves) decomposed by *Clavaria dendroidea*, *C. gracilis*, *C. ligula*, *Merulius lacrymans*, *Polyporus* [*Polystictus*] *abietinus* [ibid., 12, p. 343], and *P. versicolor* [ibid., 16, p. 139] were 31·2, 18·2, 23·5, 15·4, 53, and 54·4, respectively, the proportions of lignin amounting to 62·3, 53, 46, 0, 67·8, and 73·7, respectively, and of cellulose to 21·1, 0, 23·7, 18, 82·7, and 80·8, respectively.

Lilly (V. G.) & Barnett (H. L.). **Growth rates, vitamin deficiencies, and sclerotia formation by some Sclerotiniaceae.**—*Proc. W. Va Acad. Sci.*, 20, 9–11, pp. 69–74, 1949.

In these investigations two isolates of *Sclerotinia minor* were partially deficient in thiamine and biotin formation, the addition of these vitamins greatly increasing the production of sclerotia. Two isolates of *Botryotinia* [*Sclerotinia*] *convoluta* [*R.A.M.*, 25, p. 235] were slightly deficient in the production of thiamine; when it was added to the medium sclerotia formed faster than in the control. One isolate of *Lambertella corni-maris* [ibid., 27, p. 368] was deficient for thiamine and partially deficient for biotin.

Lilly (V. G.) & Barnett (H. L.). **Growth rates and vitamin deficiencies of various fungi.**—*Proc. W. Va Acad. Sci.*, 19, 8–1, pp. 27–33, 1949.

The results of experiments showed that *Basisporium gallarum* [*Nigrospora oryzae*] *Gibberella zeae*, and *Chaetomium globosum* made adequate growth in the absence of vitamins under given environmental conditions; *Pleurotus ostreatus* and *Lenzites trabea* were partially deficient for thiamine, while *Gnomonia veneta*, *Daedalea quercina*, *Epichloe typhina*, *Collybia velutipes*, and several species of *Polyporus* were deficient for one or more vitamins.

Elliott (E. S.). **Effect of vitamins on growth of some graminicolous species of Helminthosporium and Fusarium.**—*Proc. W. Va Acad. Sci.*, 20, 9–11, pp. 65–68, 2 graphs, 1949.

In tests of vitamins on the growth of fungi *Fusarium culmorum*, *F. avenaceum*, *F. moniliforme* [*Gibberella fujikuroi*], *F. poae*, *Helminthosporium gramineum*, and *H. victoriae* were found to be self-sufficient with respect to thiamine, biotin, pyridoxine, and inositol. The growth of one isolate of *F. avenaceum* was depressed by addition of vitamins to the vitamin-free medium, growth rates indicating that thiamine was responsible for the effect. *H. avenae* was stimulated to some extent by adding thiamine to the vitamin-free medium.

Stille (B.). **Die Sporenkeimung von Aspergillus glaucus in Abhängigkeit von Temperatur und relativer Luftfeuchtigkeit.** [The spore germination of *Aspergillus glaucus* in relation to temperature and relative atmospheric humidity.]—*Arch. Mikrobiol.*, 14, 1, pp. 108–112, 2 graphs, 1948.

Experiments at the State Research Institute, Karlsruhe, showed that the spores of *Aspergillus glaucus* [*R.A.M.*, 28, p. 347, and cf. p. 411] kept at the optimum temperature of 30° C. could germinate at 70 per cent. relative air humidity, which was the minimum. For germination at higher or lower temperatures the relative humidity must be higher and at the maximum (43°) and minimum (—8°) temperatures the spores germinate only at 100 per cent. relative air humidity. The more the relative humidity deviates from the optimum the longer the spores take to germinate.

Roguing the seed Potato crop.—*Notes for Farmers*, 10, 19, pp. 149–151, 1949.

This article gives the reasons for and methods of roguing seed potato crops in Scotland in order to maintain varietal purity and certain types of plant growth, and for the control of black leg [*Erwinia phytophthora*], leaf roll [*R.A.M.*, 28, p. 304], and viruses X and Y [loc. cit.].

Eddins (A. H.), Ruehle (G. D.), & Townsend (G. R.). **Potato diseases in Florida.**—*Bull. Fla agric. Exp. Sta.* 427, 96 pp., 40 figs., 1 map, 1946. [Received March, 1949.]

Descriptions are given of the symptoms of and control methods for the diseases

of potatoes occurring in Florida caused by fungi, bacteria, and viruses and for various physiological disorders. The principal diseases are blight (*Phytophthora infestans*), common scab (*Actinomyces scabies*), ring rot (*Corynebacterium sepedonicum*), soft rot (*Erwinia carotovora*), brown rot (*Bacterium* [*Xanthomonas*] *solanacearum*), and leaf roll. The control measures for each disease and disorder are also summarized in tabular form at the end of the bulletin. A bibliography of 79 references is appended.

Black (W.). **Breeding for disease-resistance in Potatoes.**—*Emp. J. exp. Agric.*, 17, 66, pp. 116–124, 1949.

Recent available information concerning the breeding of potatoes for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, 27, p. 291], *Phytophthora infestans* [ibid., 27, pp. 291, 579, 580], viruses A, X, and Y [ibid., 27, p. 579], leaf roll [loc. cit.], and scab (*Actinomyces scabies*), which is contained in this paper, has been noticed from time to time in this *Review*.

Samuel (G. G.). **The control of Potato diseases.**—*J. R. agric. Soc.*, 109, pp. 118–127, 1948.

A discussion which contains many items of interest is given on the production in Great Britain of potato 'seed' free from leaf roll and rugose mosaic [potato virus Y: *R.A.M.*, 28, p. 301] by means of seed certification and roguing, the building-up of stocks free from mild mosaic [potato virus X: see preceding abstract], and tuber inspection and other means of controlling common scab [*Actinomyces scabies*], skin spot [*Oospora pustulans*: ibid., 22, p. 449], powdery scab [*Spongospora subterranea*], blight [*Phytophthora infestans*], dry rot [*Fusarium caeruleum*: ibid., 28, p. 140], and wet rot [*Pythium ultimum*: ibid., 24, p. 163]. Scorch occurs on soils deficient in potash [ibid., 26, p. 78]. Recommendations for haulm-killing are also given [ibid., 28, p. 140].

Wilkinson (R. E.) & Blodgett (F. M.). **Effect of the leaf roll and X viruses on stand and yield of Potatoes.**—Abs. in *Amer. Potato J.*, 26, 3, p. 104, 1949.

Experiments were carried out in 1947 with Katahdin, Chippewa, and Sebago potatoes in plots naturally infected with leaf roll [*R.A.M.*, 28, p. 412] and virus X [ibid., 26, p. 413; 28, p. 78] to determine the effect of the diseases on stand and yield. All tubers came from the same field the previous year, were stored under the same conditions, and were indexed in the greenhouse during the winter for the presence of viroses.

The Katahdin and Chippewa plots gave 90 per cent. of a full stand and the principal effect of the diseases appeared in yield reductions. The virus-free plots yielded 365 bush. per acre, while the yield reductions for virus X, virus X in the presence of leaf roll, leaf roll, and leaf roll in the presence of virus X were 23, 74, 95, 146 bush. per acre, respectively, while both diseases together gave a reduction of 169 bush.

In Sebago, in addition to an effect on yields, there was a marked effect on the stands. From the 60 seed pieces planted in each plot, 40 hills grew from healthy sets, 20 from those with virus X, 34 from those affected with leaf roll, and 13 from those affected with both X and leaf roll viruses.

Richardson (L. T.) & Racicot (H. N.). **The comparative efficiency of tuber indexing and tuber planting in the elimination of virus diseases from seed Potatoes.**—Abs. in *Amer. Potato J.*, 26, 3, pp. 100–102, 1949.

During the winter of 1943–44, 1,000 Green Mountain seed potato tubers from Prince Edward Island were tuber indexed in the greenhouse, and the healthy ones

planted by tuber unit in the field next spring. The same number of tubers was planted in the field, without indexing, by tuber units (4 plants to a unit). All viroses were recorded, and the infected plants eliminated as soon as possible, in both greenhouse and field. The same procedure was repeated five times with the progeny of the indexed and unindexed plots. The percentage of virus diseases removed by tuber indexing in the greenhouse was 1·8, 4·5, 7·5, 2·2, and 1·4, respectively. The percentage of viroses occurring in the remaining healthy plants in the field each year was 1·6, 1, 1·5, 0·6, and 2·6, whereas in the tuber unit plot the respective percentage was 2·7, 3·9, 29·9, 8·9, and 16·4.

This evidence indicates that under Ottawa conditions tuber indexing is more efficacious in eliminating potato virus diseases than tuber unit planting.

MACLEOD (D. J.). **Studies on the bunch-top (purple-top wilt) disease of Potatoes.**—Abs. in *Proc. Canad. phytopath. Soc.*, 16, pp. 14–15, 1949.

Investigations into the bunch top (purple top wilt) disease of potatoes [*R.A.M.*, 27, p. 86] indicated that the disease is caused by a virus similar to aster yellows virus [ibid., 26, p. 411], but not identical with the type strain. The virus was repeatedly transmitted by grafting from infected potato to potato, tomato, *Datura stramonium*, *Nicotiana rustica*, *N. glutinosa*, and tobacco, inducing characteristic symptoms in all the hosts; it was also graft-transmissible from tomato to potato. All attempts to transmit the virus from infected potatoes to asters by means of *Macrosteles divisus* failed [loc. cit.]. Infected tubers become first soft and then hard, the eyes usually germinated slowly, sometimes not until after two years. Plants from infected tubers are only occasionally invaded and then the symptoms resemble those of haywire [ibid., 17, p. 302].

A combination of the purple top wilt virus and leaf roll virus produced a vascular necrosis at the stem end of Green Mountain tubers, similar to net necrosis [ibid., 27, p. 85] with the typical fluorescence in ultra-violet light. A type of purple top was also found which was attributed to mechanical injury to the roots and stems of certain potato varieties.

[The same abstract also appears in *Amer. Potato J.*, 26, 3, pp. 95–96, 1949.]

MCGOLDRICK (F.) & SMITH (O.). **Killing Potato vines.**—*Proc. Amer. Soc. hort. Sci.*, 51, pp. 401–405, 1948.

The results of experiments at Cornell University in 1946 and 1947 with various potato vine killers [*R.A.M.*, 28, pp. 140, 479] demonstrated that penite 6 (1½ gals. per acre) plus activator (6½ lb.) was most effective, dowspray 66 improved (2½ gals.), sinox general (1½ qts. plus 2½ gals. diesel oil) [ibid., 27, p. 581], penite 6 without activator, and sizz flame (three minutes per plot with a Hauck hand burner) gave satisfactory kills, while cyanamide X-5 (50 lb. per acre) and X-1 (50 lb.) were fairly satisfactory, especially on leaves.

Yields were lower in rapidly killed plots than in controls or poorly killed plots. Differences between killing dates indicate that increase in tuber size during late stages of maturity warrant delaying the application of vine killers as long as possible unless greater size is objectionable. Vascular discoloration was decidedly increased by killing injury to the tops. The value of tubers as a source of seed was not affected by the killing agents or dates of application.

Canada Department of Agriculture. Consolidated and revised regulations of the Destructive Insect and Pest Act.—10 pp., 1949.

These consolidated and revised plant disease regulations under the Destructive Insect and Pest Act governing the admission of plants into Canada became effective on 1st April, 1949.